

FINAL REPORT

UPDATING OF ADAPT PREDICTIONS OF SUNSPOT ACTIVITY

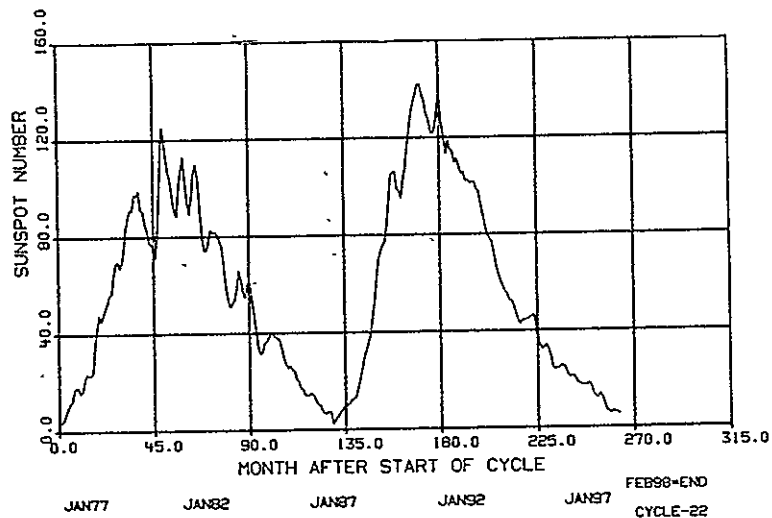
BY

HERBERT E. HUNTER

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ADAPT PREDICTIONS FOR SUNSPOT CYCLES 21 AND 22



PREPARED FOR:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

PREPARED BY:

ADAPT SERVICE CORPORATION
BOX 58
READING MASSACHUSETTS 01867

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ABSTRACT

An eigenvector analysis procedure is used to analyze and develop algorithms for predicting sunspot numbers. The predictors used in these algorithms consist of sunspot number from the preceding two solar cycles and magnetic index data from the preceding cycle. Predictions are presented for Cycles 21 and 22. The sunspot activity for Cycle 21 is predicted to remain below 100 until early 1980 when it will rapidly reach a peak of approximately 120. The two sigma accuracy on these estimates is approximately 20 sunspot numbers in the region of the peak and 10 sunspot numbers early and late in the cycle. Algorithms were also developed for predicting the period of future sunspot cycles using the same predictor vector.

It is shown that the eigenvector expansion has three useful functions. These functions are: 1) to provide a way to reduce the dimensionality of the problem to allow application of classical regression techniques to very large data vectors, 2) to provide additional insight into the nature of the sunspot cycles especially with respect to the validity of the earlier sunspot data and 3) to provide a way of representing the sunspot cycles by a limited number of numbers (6-in this case) which may be predicted and then used to reconstruct the cycle.

The eigenvector analysis suggested that the gross features of the early cycles (i.e. cycles 1 through 11) are valid but that some of the finer structure has changed since the early cycles and some of the fine structure for the early cycles does not appear to have been obtained with sufficient accuracy.

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1.0 INTRODUCTION

The study of sunspots has become increasingly important as the understanding of solar terrestrial relationships have increased. The sunspot number is one of the more significant measures of solar activity because of the relatively long period over which it has been monitored. Prediction of solar activity is particularly important to space flight because of its effect upon upper atmospheric density (i.e. satellite life time), and radiation hazards for instrumentation and manned space flight. It has also been hypothesized that the solar activity can be correlated with climatic changes. Considerable effort has been devoted to developing techniques to predict the sunspot number or other measures of solar activity in the last few decades.

The ADAPT Service Corporation first applied its eigenvector analysis techniques to this problem in 1972 (1). These techniques have developed around a unique capability to economically derive the eigenvector expansion for a large number of large data vectors (i.e. 2000 vectors of 2000 components each). The 1972 studies were motivated by a need for NASA to predict the satellite life times of the HEAO satellite which at that time was expected to be orbited near the beginning of sunspot Cycle 21. Thus, the major effort of the 1972 study was to develop an extrapolation technique to extrapolate solar activity to the end of Cycle 20 based on the portion of Cycle 20 which already had occurred. Initial studies of prediction methods which will be reported in this paper were started at that time but since Cycle 20 was approximately two-thirds complete the extrapolation techniques were emphasized.

This paper presents the results of a study to develop techniques for predicting future sunspot cycles based on the preceding two sunspot cycles plus magnetic index information. In addition, to making use of the studies performed in 1972, these studies are also related to many previous analyses of solar activity. One question which has been important to the development of solar activity predictions, has been the attempt to understand the validity of the earlier data on sunspot numbers. This has been discussed extensively in the literature by McNish (2) Eddy (3) and more recently by Sargent (4). Eddy presents convincing evidence that sunspot activity essentially stopped during the second half of the 17th century. The existence of such anomalies must be considered

when evaluating the expected confidence in any estimate of future solar activity based on an empirical approach.

The second major concern has been whether the data obtained in the late 18th century and early 19th century is of the same quality as the more recent data. Both McNish and Sargent have presented arguments that this earlier data is suspect. In this paper, we shall study this question in considerable detail and suggest that the validity of the earlier data has a more complex answer than a simple yes or no.

This study has used the ADAPT eigenvector analysis technique to develop algorithms to estimate both the expected period and the sunspot numbers as a function of time for the next sunspot cycle. We shall first present a discussion of the development and performance of the algorithm for estimating the period. Next, we will present and discuss the eigenvector representation of the sunspot cycles and show how this representation can be used to provide a better understanding of how the earlier sunspot data should and should not be used. We shall then present and discuss the predictions developed for sunspot cycles 21 and 22 which essentially cover the remainder of this century.

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2.0 ESTIMATE OF SUNSPOT PERIOD

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The algorithm for estimating the future sunspot period was developed using the general eigenvector analysis approach which has been applied to many different problems in engineering, sociology and physics by the ADAPT Service Corporation and may be described as follows:

Step 1 - Develop the eigenvector expansion for the predictor variables.

Step 2 - Expand the predictor variables in terms of their eigenvector representation.

Step 3 - Develop a regression line relating the quantity to be predicted, sunspot period in this case, to the coefficients of the eigenvector expansion of the predictor variables.

Step 4 - Transform the regression line derived in Step 3 back to the original predictor vector space by using the inverse of the eigenvector transformation derived in Step 1. (Because of orthogonality, the inverse is equal to the transpose).

When this procedure has been completed, one has an algorithm which may be applied to any new predictor vector to derive the period of the next sunspot cycle. Analysis in the eigenvector space has a number of advantages relative to analysis in the original space. These include: 1) the amount of computation required is reduced, 2) analysis of the variation in the data provides additional guidance for the analysis, 3) the matrices to be inverted for most pattern recognition and regression techniques are guaranteed to be non-singular, 4) all of the predictor variables are linearly independent and 5) the number of degrees of freedom associated with the problem have been reduced by an independent criteria. The last of these is very important for the present study because it reduces the number of training cycles required and monthly sunspot numbers are only available for twenty cycles.

For this study, the predictors that were considered consisted of the three month running average of the sunspot number of the preceding two cycles, the AA magnetic index for the preceding cycle and the annual running average for the

cycle occurring 180 years prior to the cycle to be predicted. The average of this predictor vector for predicting cycles 12-21 is shown in Figure 1. The abscissa of this figure is in months. The ordinate corresponding to months 1 through 180 is the 3 month running average of the monthly sunspot number for the cycle immediately preceding the cycle for which the period is to be estimated. The values from the end of the cycle through the 180th month have been filled with zeros. The sunspot numbers for the second cycle preceding the cycle for which the period is to be estimated has been placed in months 181 to 360. These components were selected based on the hypothesis that the solar activity of any given cycle is related to the solar activity over the preceding two cycles. The reasonableness of this hypothesis was demonstrated by the preliminary studies performed as part of the 1972 studies (1).

The AA magnetic index for the cycle immediately preceding the cycle to be estimated is the ordinate for months 361 to 540. The magnetic index was incorporated based on the hypothesis suggested by Ohl and used by Sargent (4) that the solar activity for any given sunspot cycle is related to the magnetic index occurring during the preceding sunspot cycle. Since a number of investigators (5) have suggested the existence of a 180 year period in solar activity, the 12 month running annual mean sunspot number for the 180 year analog of the cycle to be estimated is used for abscissa values 541 to 559. Each of these four segments of the predictor vectors was then normalized to have a unit magnitude and averaged over the last eleven cycles to produce the average shown in Figure 1. This average was then subtracted from each of the data vectors to give zero mean vectors for the remainder of the analysis.

The first step in the eigenvector analysis was to attempt to determine which portions of this combined predictor vector were most significant for predicting the period of the sunspot cycle. Although the number of sunspot cycles available was insufficient to provide a conclusive answer to this question, it was shown that within the limitations of the available data the best forecast of future sunspot period could be obtained by using only the AA magnetic index from the preceding period.

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FIGURE 1 - AVERAGE OF COMBINED
PREDICTOR VECTOR TO PREDICT CYCLE N

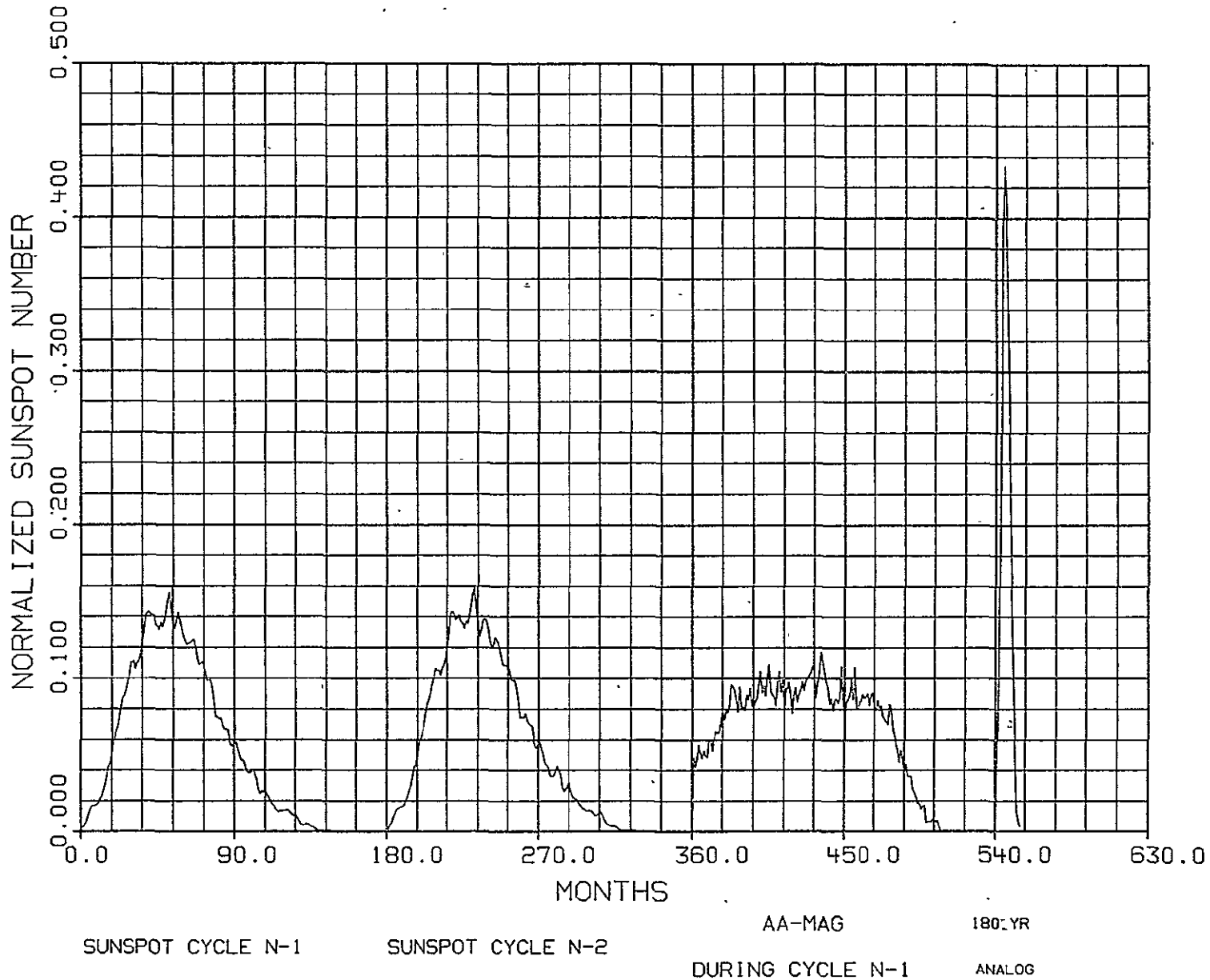


Table 1 summarizes the start dates of the 21 cycles considered in this study. Figures 2 and 3 present plots showing the performance of the algorithms derived to estimate these periods. These figures consist of plots of the actual period as the abscissa and the estimated period as the ordinate. The symbols used are defined in Table 1.

Figure 2 presents the performance of the algorithm to estimate the period using only the AA magnetic index of the preceding period as the predictor. This algorithm worked the best of any of those developed to predict the period. It had a correlation of 0.93 between the estimated and actual periods.

Unfortunately, there are cases for which one does not have the AA magnetic index. For these cases, it is desirable to have a way of estimating a period based only on the preceding sunspot numbers. Thus, a second algorithm was developed using only the sunspot numbers as a predictor. This algorithm did not perform as well as that derived using the AA magnetic index but did have a correlation of .86 and its performance is plotted in Figure 3.

FIGURE 2 - COMPARISON OF PERIOD ESTIMATED USING AA-MAGNETIC INDEX WITH ACTUAL PERIOD (CORRELATION=.93)

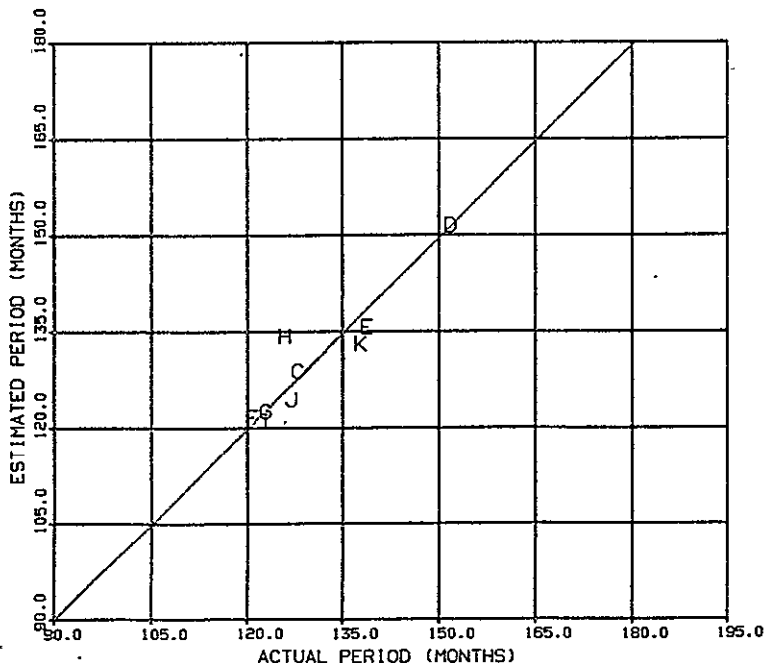
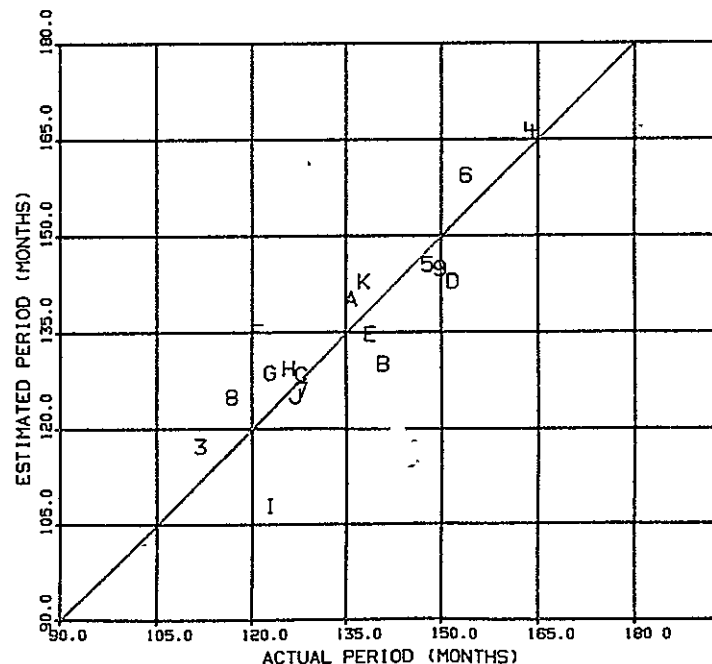


FIGURE 3 - COMPARISON OF PERIOD ESTIMATED USING ONLY SUNSPOT DATA WITH ACTUAL PERIOD (CORRELATION.86)



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TABLE 1 - START DATES OF SUNSPOT CYCLES
1-23 USED IN THIS STUDY*

CYCLE NO.	START DATE	SYMBOL USED ON PLOTS
1	2/1755	1
2	6/1766	2
3	6/1775	3
4	9/1784	4
5	4/1798	5
6	7/1810	6
7	4/1823	7
8	11/1833	8
9	7/1843	9
10	12/1855	A
11	3/1867	B
12	11/1878	C
13	6/1889	D
14	1/1902	E
15	7/1913	F
16	7/1923	G
17	9/1933	H
18	2/1944	I
19	4/1954	J
20	10/1964	K
21	3/1976	L
22	10/1986	M
23	12/1998	N

* Note that the present study used the three month running average with the value assigned to the end point of the average. Thus, these dates tend to be one month later than for the monthly values or 13-month running average with the value assigned to the mid point. It should also be noted that the prediction of sunspot numbers as a function of months after start are independent of these dates.

It is useful to examine the projection of the regression line in the space of the original predictor vector. This projection allows one to determine the importance of each component of the predictor vector to the particular algorithm which has been derived. Thus, we may call these "relative importance vectors". Figures 4 and 5 present relative importance vectors for the AA index and the sunspot number algorithms, respectively. Figure 4 shows that it is the narrow band structure of the AA magnetic index which is most significant for determining the period of the next sunspot cycle. There is a great deal of energy in components associated with a period of approximately six months. Figure 5 shows that both of the preceding cycles are important to estimating the period of the sunspot cycle. The relative importance for the cycle immediately preceding the period to be estimated (i.e. months 181-360 on Figure 5) shows a narrow band structure superimposed on a broadband structure. The broadband structure shows that higher than average sunspots from 4 to 8 years and lower than average from 8 to 10 years after the beginning of the immediately preceding cycle will lead to a relatively short cycle.

FIGURE 4 - RELATIVE IMPORTANCE OF MAGNETIC AA-INDEX TO ESTIMATE OF PERIOD FOR REPRESENTING SUNSPOT CYCLE

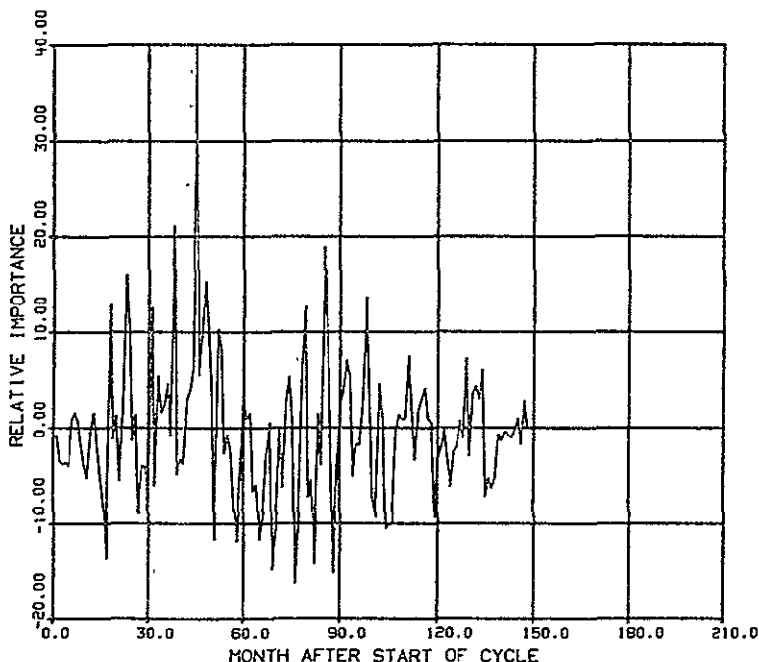
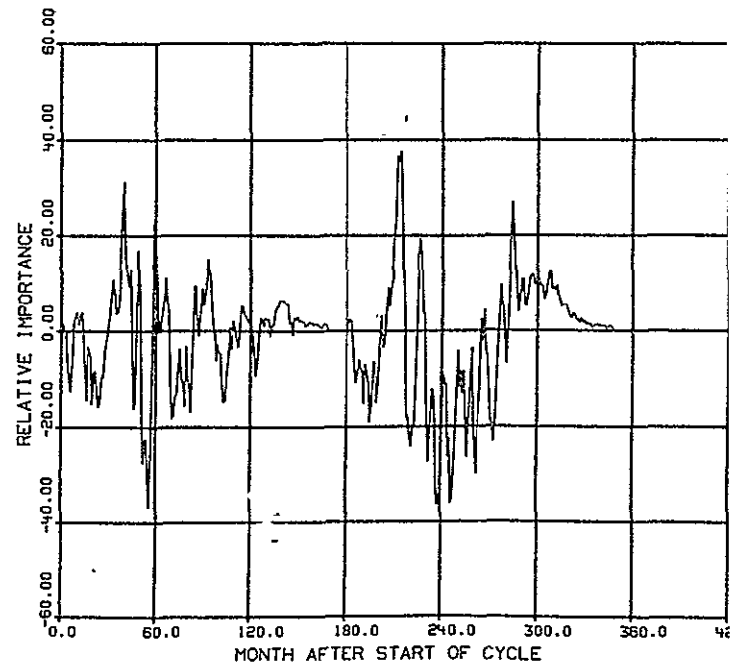


FIGURE 5 - RELATIVE IMPORTANCE OF SUNSPOTS TO ESTIMATE OF PERIOD FOR REPRESENTING SUNSPOT CYCLE



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3.0 EIGENVECTOR REPRESENTATION OF THE SUNSPOT CYCLES

The preceding section showed some of the advantages of the eigenvector representation for predicting a single number such as the period of the sunspot cycle. The eigenvector expansion also provides a unique mechanism for predicting the entire sunspot cycle. In addition to using the eigenvector expansion of the predictor vectors to improve the ability to derive the regression algorithm, we shall use the eigenvector expansion to represent the sunspot cycles. Before presenting the derivation and results of these predictions it is useful to examine the eigenvector expansions of the sunspot cycles.

Figure 6 presents a plot of sunspot Cycles 1 through 22 covering the period for approximately 1750 to the year 2000. The last two cycles in the plot are based on predictions which we shall present in more detail in the next section. The eigenvectors for Cycles 1 through 20 were derived. Figures 7A through 7L present the characteristics of this eigenvector expansion. Figure 7A presents the average of sunspot Cycles 1 through 20. This average was subtracted from each cycle prior to deriving the eigenvector expansion and is added back to the reconstructed cycles. Thus, the eigenvector expansion is actually an expansion of the deviation from the mean.

Figure 7B is two curves which plot the explained variation as a function of the eigendirection and the cumulative sum of the explained variation. This figure shows that the first eigenfunction explains approximately 68% of the variation in the entire set of 21 sunspot cycles. The second eigendirection explains approximately 15% so that the first two eigendirections taken together explain 83% (upper curve, at two dimensions) of the variation in the sunspot cycles. The remaining eigendirections explain considerably less of the variation.

Figure 7C through 7H show the first six eigenvectors associated with these sunspot cycles. Figure 7C essentially determines the magnitude of the sunspot cycle. Thus, about 68% of the variation associated with the sunspot cycles is variation in magnitude of the sunspot cycles. Figure 7D shows that the second eigenfunction primarily determines whether

FIGURE-6 3 MONTH RUNNING MEAN SUNSPOT NUMBERS 1750 TO 200

(LAST 2-CYCLES ARE ADAPT PREDICTIONS)

(PARENTHESIS UNDER CYCLE CONTAIN CYCLE NO. AND SCATTER PLOT GROUP RESPECTIVELY)

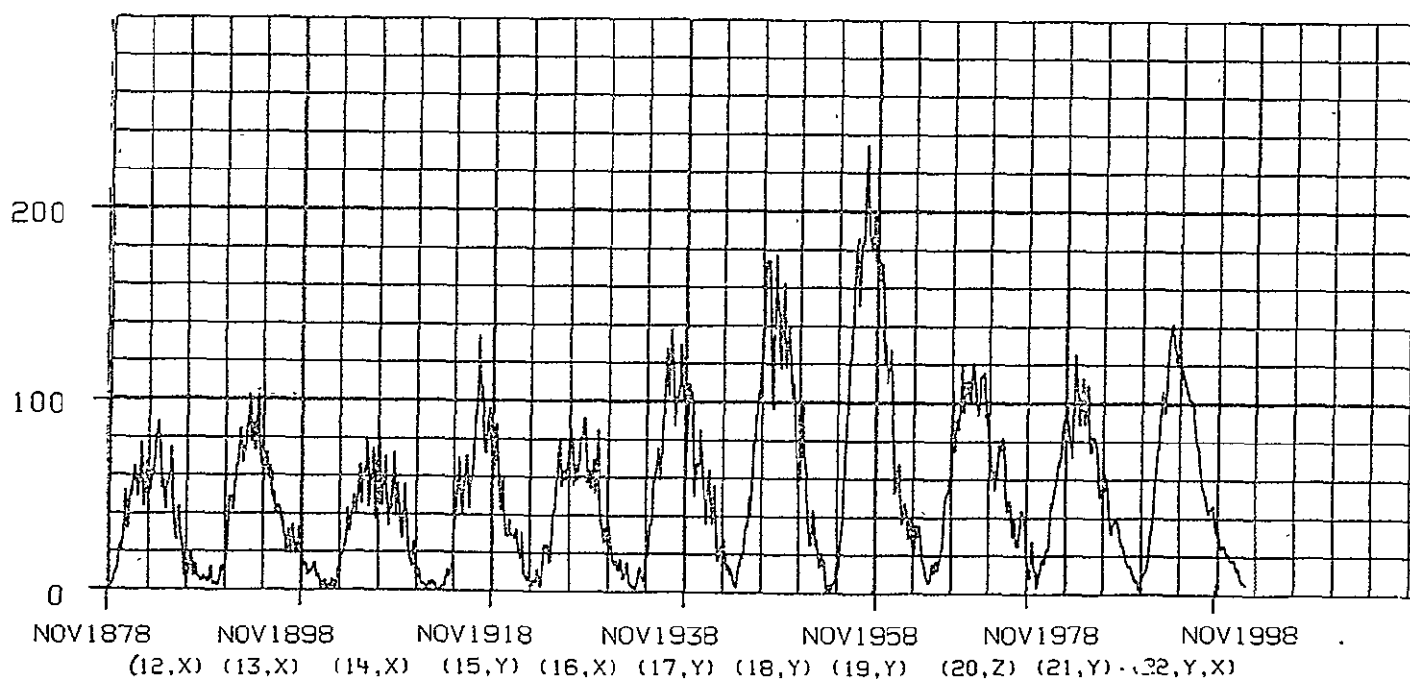
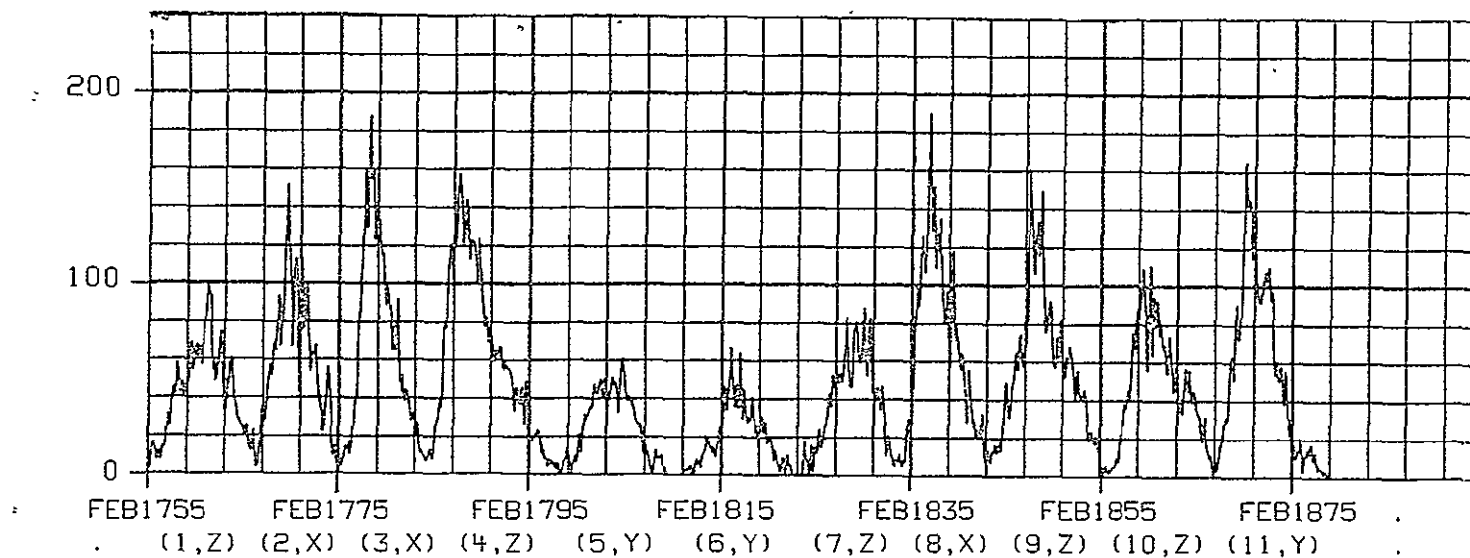


FIGURE 7A - UNNORM SINGLE
CYCLE AVERAGE INPUT VECTOR

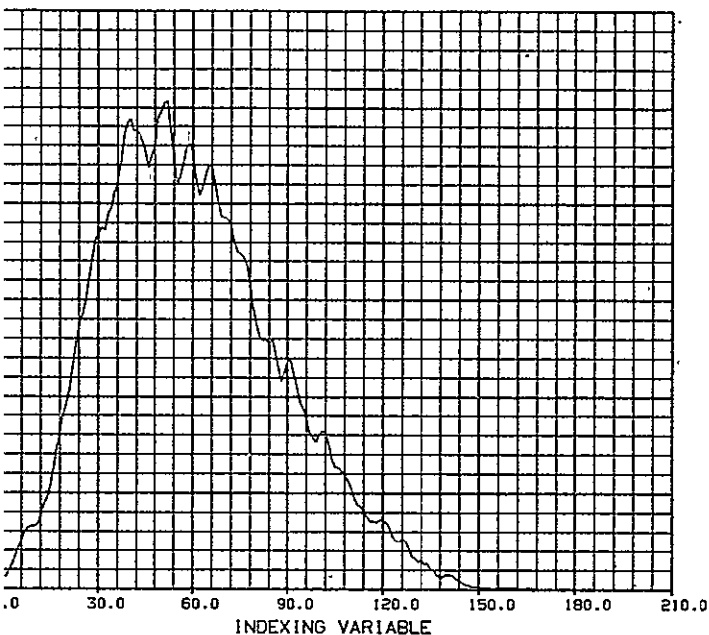


FIGURE 7B - EXPLAINED VARIATION AS A FUNCTION OF
NUMBER OF TERMS RETAINED IN EIGENVECTOR EXPANSION

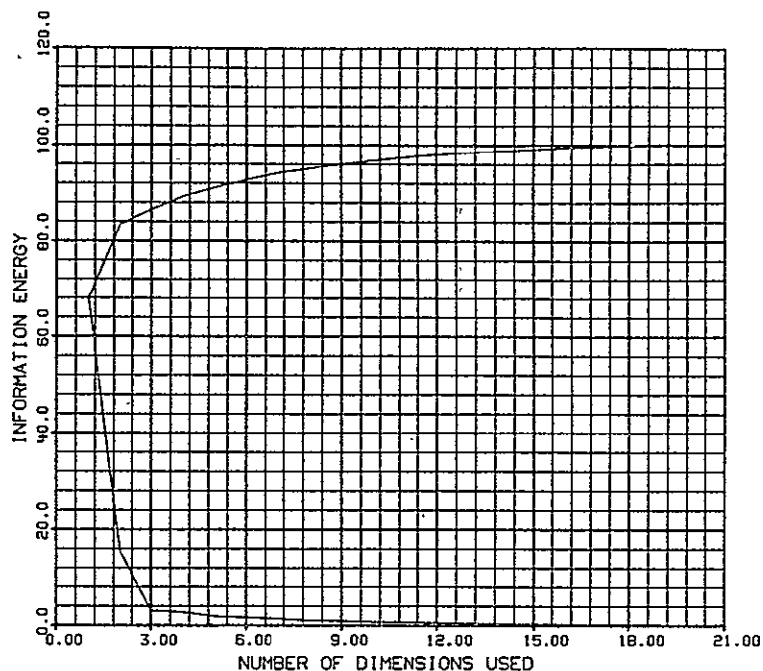


FIGURE 7C - FIRST EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

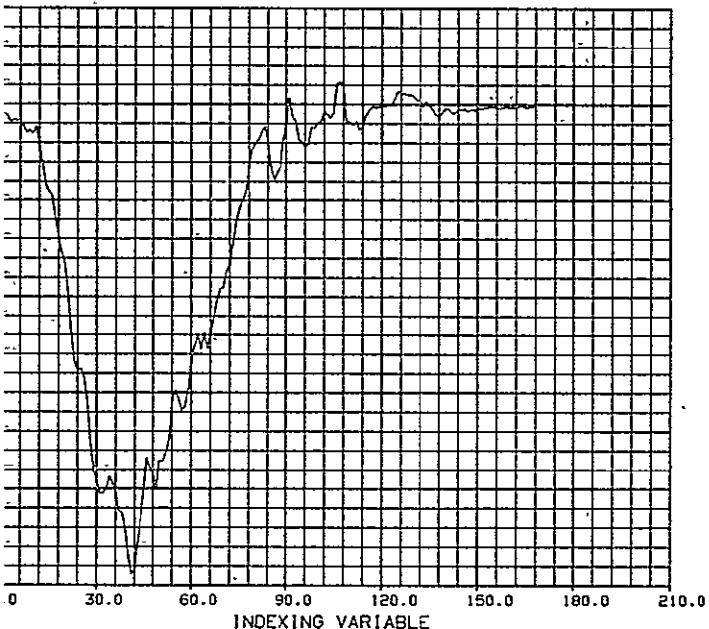


FIGURE 7D - SECOND EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

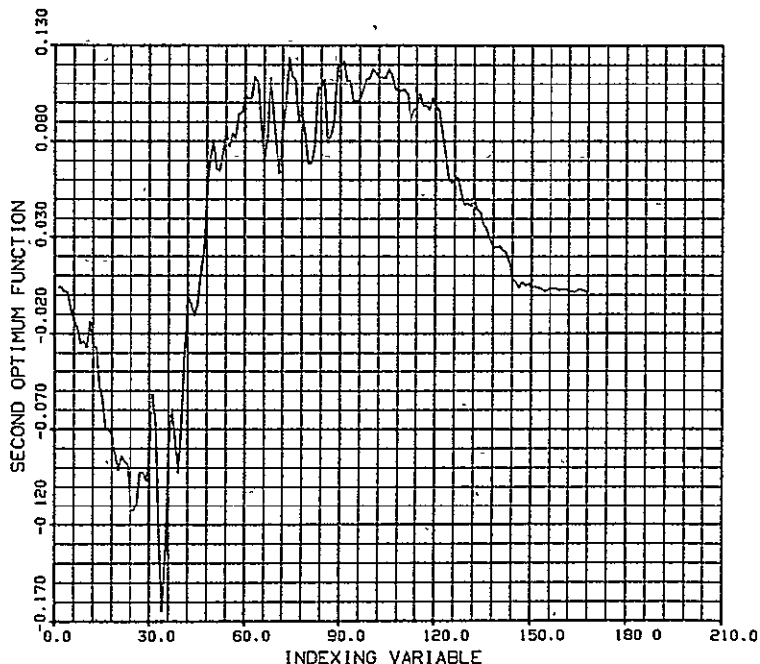


FIGURE 7E - THIRD EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

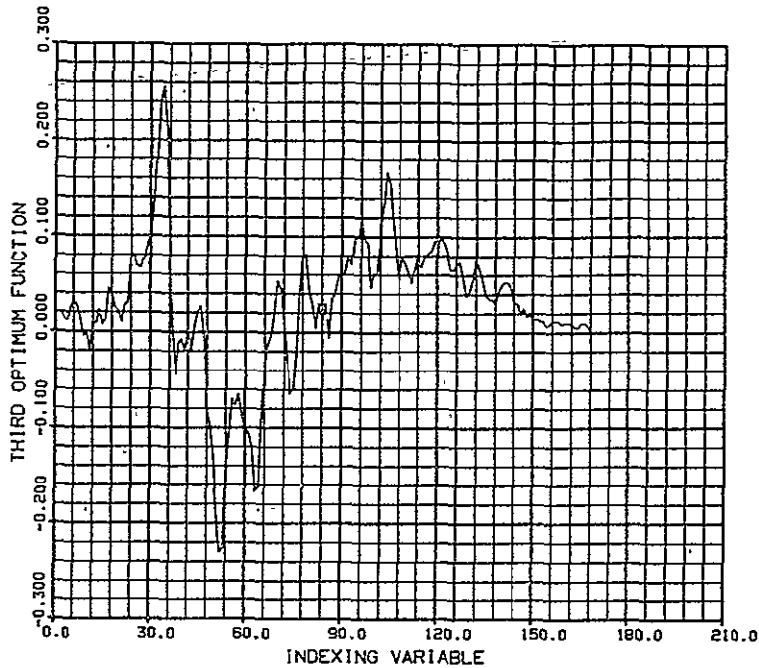


FIGURE 7F - FOURTH EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

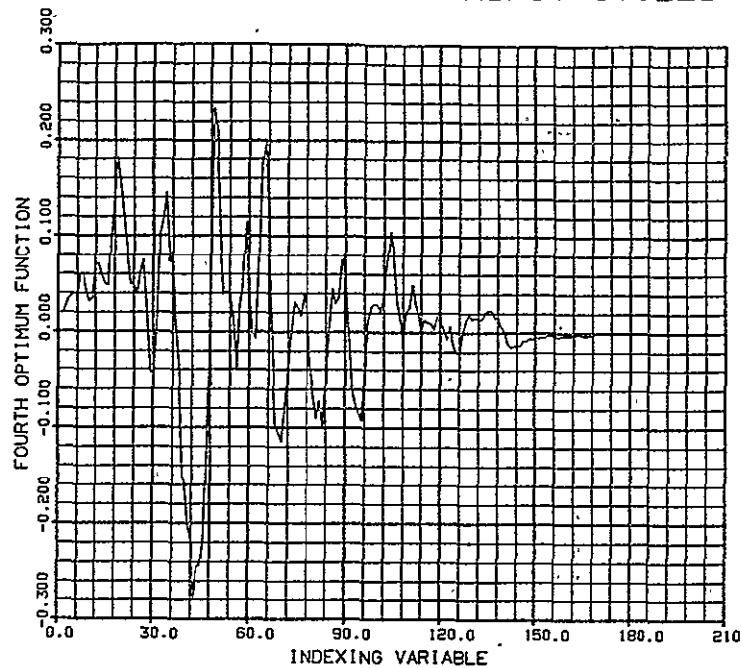


FIGURE 7G - FIFTH EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

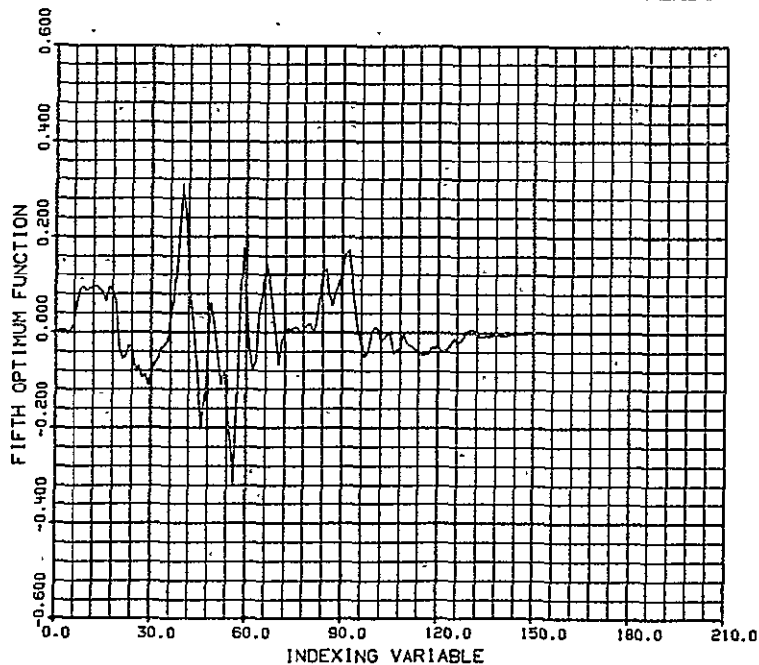


FIGURE 7H - SIXTH EIGENVECTOR
FOR REPRESENTING SUNSPOT CYCLES

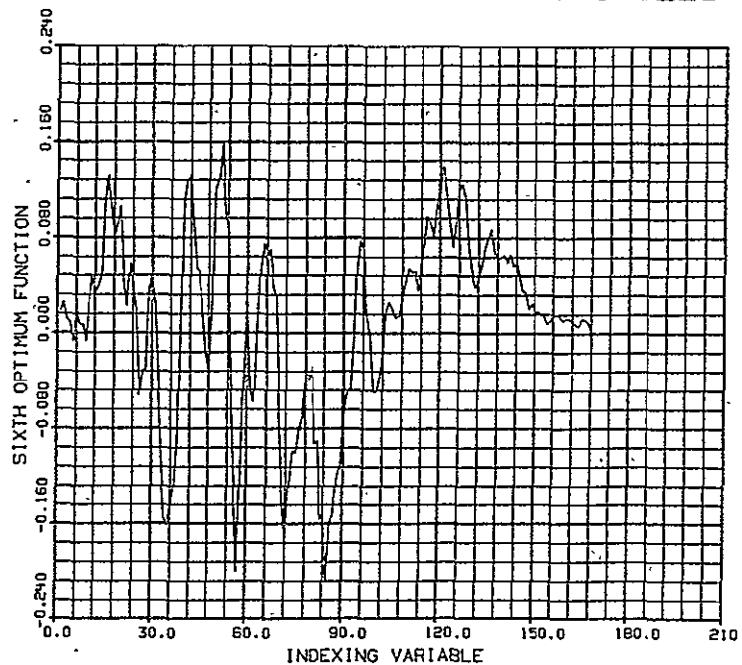


FIGURE 7I - FIRST EIGENVECTOR DERIVED
USING ONLY SUNSPOT CYCLES OCCURING BEFORE 1870

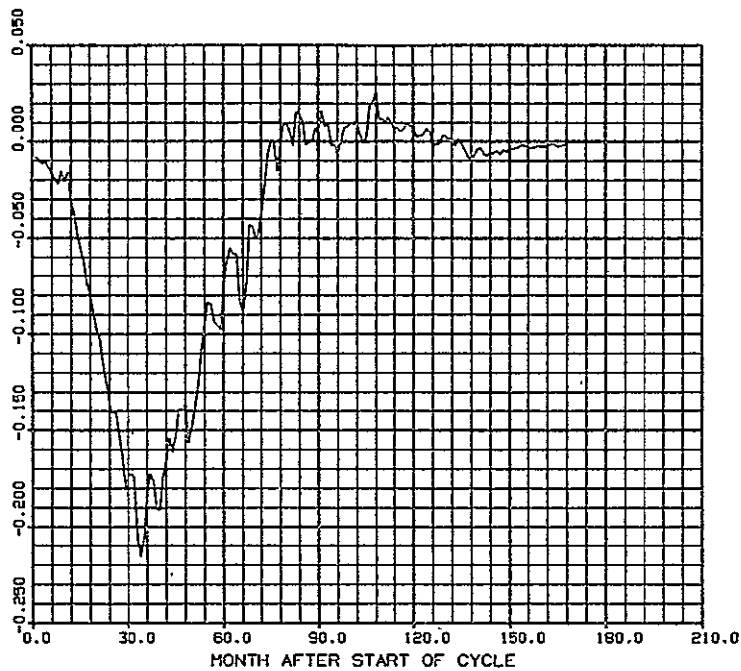


FIGURE 7J - FIRST EIGENVECTOR DERIVED
USING ONLY SUNSPOT CYCLES OCCURING AFTER 1870

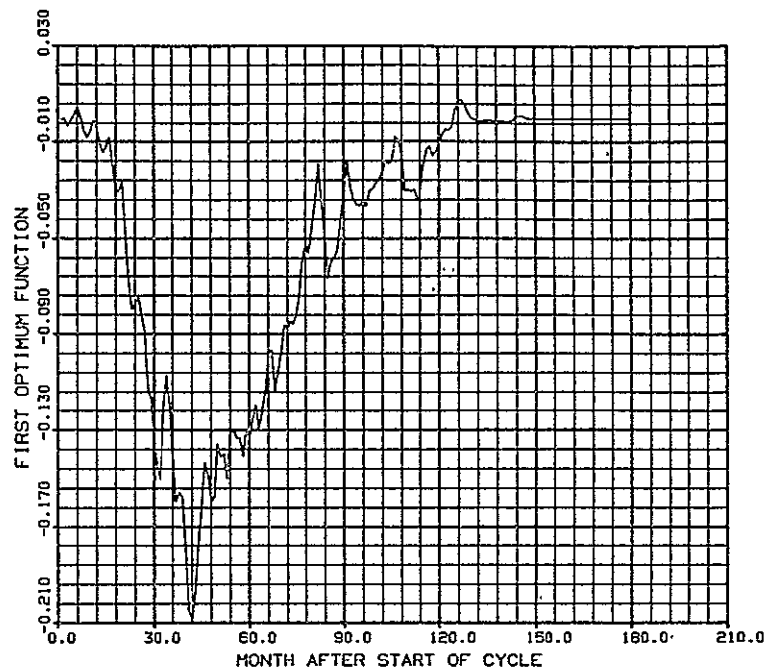


FIGURE 7K - SECOND EIGENVECTOR DERIVED
USING ONLY SUNSPOT CYCLES OCCURING BEFORE 1870

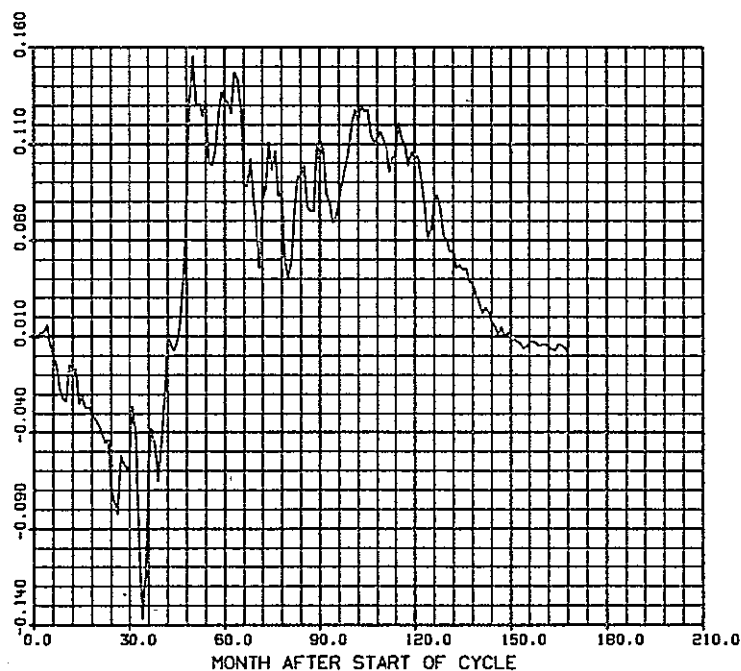
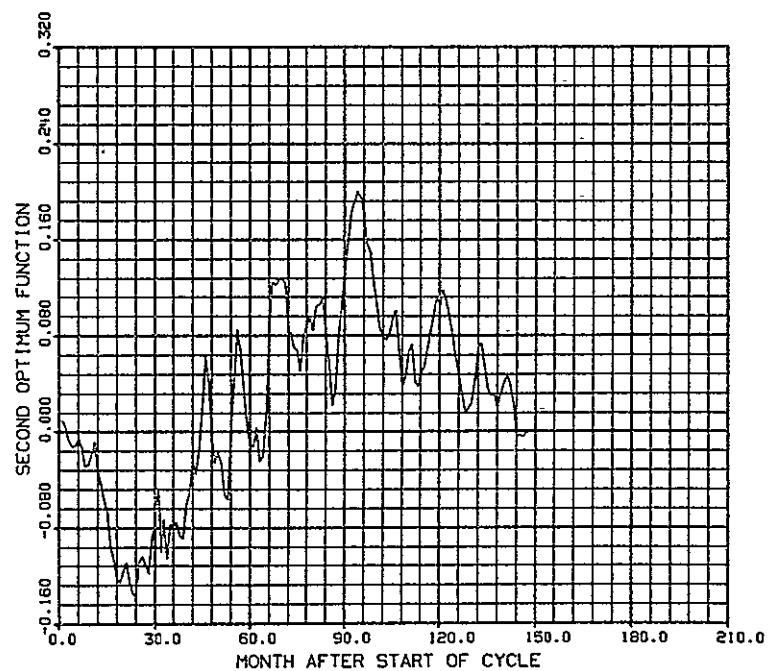


FIGURE 7L - SECOND EIGENVECTOR DERIVED
USING ONLY SUNSPOT CYCLES OCCURING AFTER 1870



the cycle has an early or late peak. It also shows that a cycle that rises rapidly to an early peak can be expected to decrease more rapidly than the average cycle and approximately 15% of the variation explains whether the sunspot cycle has an early or late peak. The third eigenfunction determines more detail structure of the peak, which is also related to the decay of the cycle. The remainder of the eigenvectors determine the fine structure of the sunspot cycles and account for about 14% of the variation.

An analysis was made of the eigenvectors to try to understand the validity of the earlier data. Figures 7I and 7J present the first eigenvector derived from only the sunspot cycles prior to 1870 and only the cycles after 1870, respectively. The split at 1870 has been selected because this is the approximate time from which the AA index data is available. Figures 7I and 7J should also be compared with 7C which was derived using all of the available cycles. McNish (2) suggests that the data before 1830 is suspect and Sargent (4) makes the point that he believes that his estimates are better than earlier estimates both because of the use of the magnetic data and because he only uses the data subsequent to 1870.

Examination of Figure 7I and 7C shows that if one had developed the eigenvector expansion over 100 years ago, the first eigenvector which explains 68% of the variation would have been very much like the one that has been derived using all of the presently available data. Figure 7J shows that there is little change in this eigenvector even if only the modern cycles are used. This implies that the variation explained by the first eigenvector has not changed significantly since the mid 18th century.

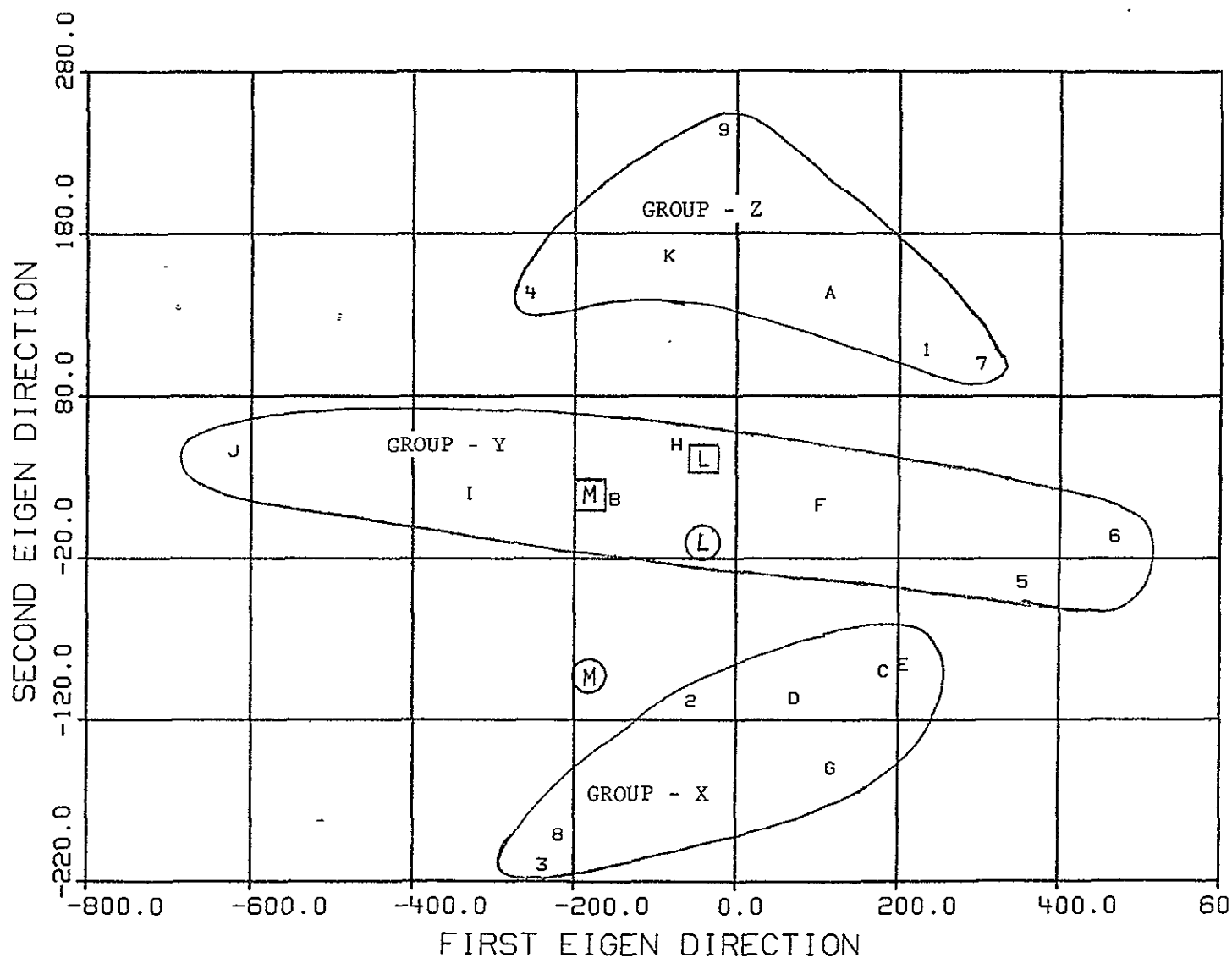
Figure 7K and L presents similar information for the second eigenfunction and should be compared with Figure 7D. These figures show that although the second eigenfunction as derived in 1870 would be quite similar to the one that we derived today, the modern sunspot cycles used by themselves lead to an eigenfunction which is quite different in detail although it still has the same general cosine shape. Examination of the higher order eigenfunction shows that in general, there is considerable difference between the modern

and the prior to 1870 eigenfunctions. This suggests that the early data was sufficiently accurate to define the gross structure of the sunspot cycles. However, the differences in the higher order eigenfunctions suggests that either the earlier data was not sufficiently accurate to define the fine structure or there has been a change in the fine structure associated with the solar activity between these two periods of time.

Figure 8 presents the projection of the first 22 sunspot cycles on the first two directions of the eigenvector space. Figure 7B showed that this projection explains 83% of the variation in the sunspot cycles. That is, the geometric position on this plot presents 83% of the information that is presented for the same cycles in Figure 6. Note, that the coefficients of each cycle plotted on this figure are also the coefficients of the corresponding eigenfunction when using a generalized Fourier series expansion in the eigenfunctions to represent that cycle.

Figure 8 may be divided into three groupings of the sunspot cycles. These have been labeled Groups X, Y and Z and these groups have also been indicated on the cycles shown in Figure 6. Examination of the distribution of these groups with time is interesting. Prior to 1870, Group Z is the most common group but since 1870, there has been only one Group Z sunspot cycle, which is Cycle 20. This suggests that there has been a change in the average character of the sunspot cycles over this time period. Figure 8 shows that these groups are defined primarily by the second coefficient, thus, these are the same changes which caused the differences observed between the 1870 and modern second eigenfunctions shown in Figures 7K and 7L. The eigenfunctions showed that the change was with respect to whether the peak is early or late. Since a Group Z cycle has occurred in the second set, one is suspicious that at least with respect to the second eigendirection these changes are real and not due to inaccuracies in the early recording of the data. It also appears that "throw backs" are possible. There is insufficient evidence in similar plots of the higher order eigendirections to reach any conclusion as to the reason for these differences, however, one would expect that both small changes in solar behavior and inaccuracies in taking the data would have a much greater effect on eigendirections which only explain two to three percent of the variation than eigendirections which explain large percentages of the variation.

FIGURE 8 - PROJECTION OF SUNSPOT CYCLES ON FIRST AND SECOND EIGEN DIRECTIONS



○ - NON-REFERENCE ESTIMATE , □ - REFERENCE ESTIMATE

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It must also be noted that if radical changes in the character of the sunspot cycle occur such as those that apparently occurred in the Maunder minimum (3), the character of the eigenvectors can be expected to change considerably. It would be very interesting to determine if the dominant eigenvectors for the sunspot cycles occurring before the Maunder minimum are similar to those occurring after the minimum. However, it is extremely unlikely that sufficient data will ever be recovered for these earlier cycles to allow one to accomplish this with any degree of confidence.

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4.0 ALGORITHMS FOR ESTIMATING THE COEFFICIENTS OF THE SUNSPOT EIGENVECTORS

The procedure for estimating the sunspot cycles is very similar to that which was used to derive the algorithms to estimate the sunspot period. The sunspot cycle can be constructed as a generalized Fourier series of the eigenvectors (Figures 7C-7H) if we know the value of the coefficient to be associated with the eigenvector for a given cycle. We may estimate each of these coefficients in the same way that the sunspot period was estimated. That is, we may form a regression relating each of the coefficients of the sunspot cycles to be estimated to the coefficients of the eigenvector representation of each of the predictor vectors.

The steps required to predict the next sunspot cycle may be summarized as: 1) derive the eigenvector expansion of the individual sunspot cycles using all of the available data, 2) expand the cycles in terms of these eigenvectors, 3) derive algorithms (just as was done to predict the period) to predict the coefficients of each term in these expansions and 4) use the predicted coefficients to reconstruct the next sunspot history.

Table 2 presents the performance that was achieved for the algorithms used to calculate the first six coefficients of the eigenvector representation of the sunspot cycles. The performance shown is based on a "one-out" test procedure or Laichenbruch's (6) "U" method. It was not possible to derive successful prediction algorithms for coefficients 7 through 15. The first column of Table 2 lists the term in the eigenvector expansion. The second column gives the variation explained by this term and is the same as the lower curve in Figure 7B.

The algorithms whose performance is given in Table 2 were derived using four different predictor vectors which we shall designate as "SS" for sunspot only, "MSS" for modern sunspot, "AA" for magnetic index and "C" for combined. The first was the combined predictor vector which is the same as that illustrated in Figure 1 and its performance is given in Column 8 of Table 2. The second used only the sunspot number information from the two preceding cycles, (abscissa points 1 through 360 of Figure 1). It is called the sunspot only predictor and its performance is shown in Columns 3 through 5 of Table 2. Column 3 gives the "one-out" test performance using the data

TABLE 2 - PREDICTION PERFORMANCE FOR EACH PREDICTOR SET

RECONST.		EXP'D		CORRELATION COEFFICIENT				USED IN ESTIMATING	
COEF..	EST.	VAR(%)		SUNSPOT ONLY		MODERN	AA-MAG	COMBINED	CYCLE
				DERIVED FROM 1755-1976		SUNSPOT			21
				EVALUATED USING DATA FROM					22
DATES USED		1755-1976	1755-1870	1870-1976	1870-1976	1870-1976	1870-1976		
SYMBOL		(SS)	(SS)	(SS)	(MSS)	(AA)	(C)		
COL NUMBER	2	3	4	5	6	7	8	9	10
1	68%	.80	.88	.72	.46	.92	.25	AA (.92)	SS (.80)
2	15%	.62	.89	I*	.86	.63	.I*	MSS (.86)	SS (.62)
3	3%	.76	.91	.49	.61	I*	.33	MSS (.61)	SS (.76)
4	3%	.85	.92	.64	.49	.26	.93	C (.93)	SS (.85)
5	2%	.53	I*	.80	I*	I*	.68	C (.68)	SS (.53)
6	2%	.58	.46	.69	I*	.81	.58	AA (.81)	SS (.58)
TOTAL	93%								

* I - denotes an imaginary correlation coefficient, i.e. the mean of the training data is a better estimate than the regression.

from 1755 to 1976. This algorithm performance was also evaluated using only the data before 1870 and then using only the data after 1870, the performances obtained are given in Columns 4 and 5, respectively. The third predictor vector used the same indexing points but only the data after 1870 was used both to derive the algorithms and evaluate the algorithms performance and this is called the modern sunspot predictor. Its performance is given in Column 6. The AA magnetic predictor used only AA index data that is points 361 through 540 on Figure 1. The AA magnetic performance is given in Column 7 of Table 2. Note, that both the combined predictor and the AA magnetic index predictor are only available for those cycles occurring after 1870. The last two columns of Table 2 summarize the predictors used to predict cycles 21 and 22 and their performance.

Table 2 shows that the first eigenvector could be best estimated using the AA magnetic index which gave a correlation coefficient of 0.92. Examination of Table 2 shows that the first coefficient is next best estimated using the sunspot only data. However, this estimate is best for the early data and is not nearly as good for the modern data.

The combined predictor containing both the AA magnetic index and the sunspot only data did not do as well as each of its components taken alone. This is due to the fundamental problem of insufficient learning cases known as "goldmining" in the pattern recognition literature and which the eigenvector approach to empirical analysis only partly overcomes. The problem is that the number of cases should be large compared to the number of degrees of freedom. Although the use of the eigenvector expansion has reduced the number of degrees of freedom of this problem, there are only 20 sunspot cycles available for the analysis. Thus, in order to have a ratio of the order 3 to 1, one can only examine six of these eigendirections. The values of this ratio which are required are a function of the performance ranging from as much as 10 to 50 for algorithms with very poor performance to as few as 2 or 3 for algorithms with good performance. Thus, there are not sufficient cases to allow simultaneous consideration of all the predictor eigendirections.

Examination of Table 2 for the second coefficient shows that the best estimate is made using the sunspot data only. For the early cycles, this is the estimate based on all of the

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sunspot cycles. However, this estimate is useless for estimating the second coefficient for the sunspot cycles occurring after 1870. However, if only the sunspot data since 1870 is used an algorithm can be derived which is good for estimating the second coefficient for the modern sunspot cycles. Note, that this is further confirmation that the character of the second eigenfunction has changed much more than the first eigenfunction between the early and modern cycles. The better performance of the sunspot only algorithms on the modern data for coefficients 5 and 6 combined with the poor performance of the modern sunspot estimates suggest the information required to characterize these eigenvectors hasn't changed significantly but was not measured with sufficient accuracy prior to 1870.

The conclusion for the third coefficient is very similar to that for the second coefficient. For the fourth coefficient, we find a similar conclusion with respect to estimating the early sunspot cycles but the combined predictor vector yields the best estimate for the modern cycles. We do not know how well that predictor would do for the early cycles since the AA index is not available over a time period required to evaluate this.

In order to arrive at a prediction for a future sunspot cycle, we must decide which of these predictor vectors should be used to estimate each of the coefficients. For some of the coefficients such as the first, fourth and sixth, this decision is relatively easy because one of the predictor vectors far out performs the others. Thus, it follows immediately from Table 2 that if the magnetic data is available, the first and sixth coefficient should then be estimated using only the magnetic data and the fourth should be estimated using the full combined predictor vectors similar to that shown in Figure 1.

In making the decision, when the performances are closer, we have considered two different philosophies. We have called these philosophies, 1) the maximum history philosophy and 2) the modern biased philosophy. In the maximum history philosophy, we assume the differences that have been observed and discussed earlier between the early and modern sunspot cycles are periodic and that we may expect sunspot cycles sometime in the future which are similar to those which have occurred prior to 1870. Under this philosophy, it is important

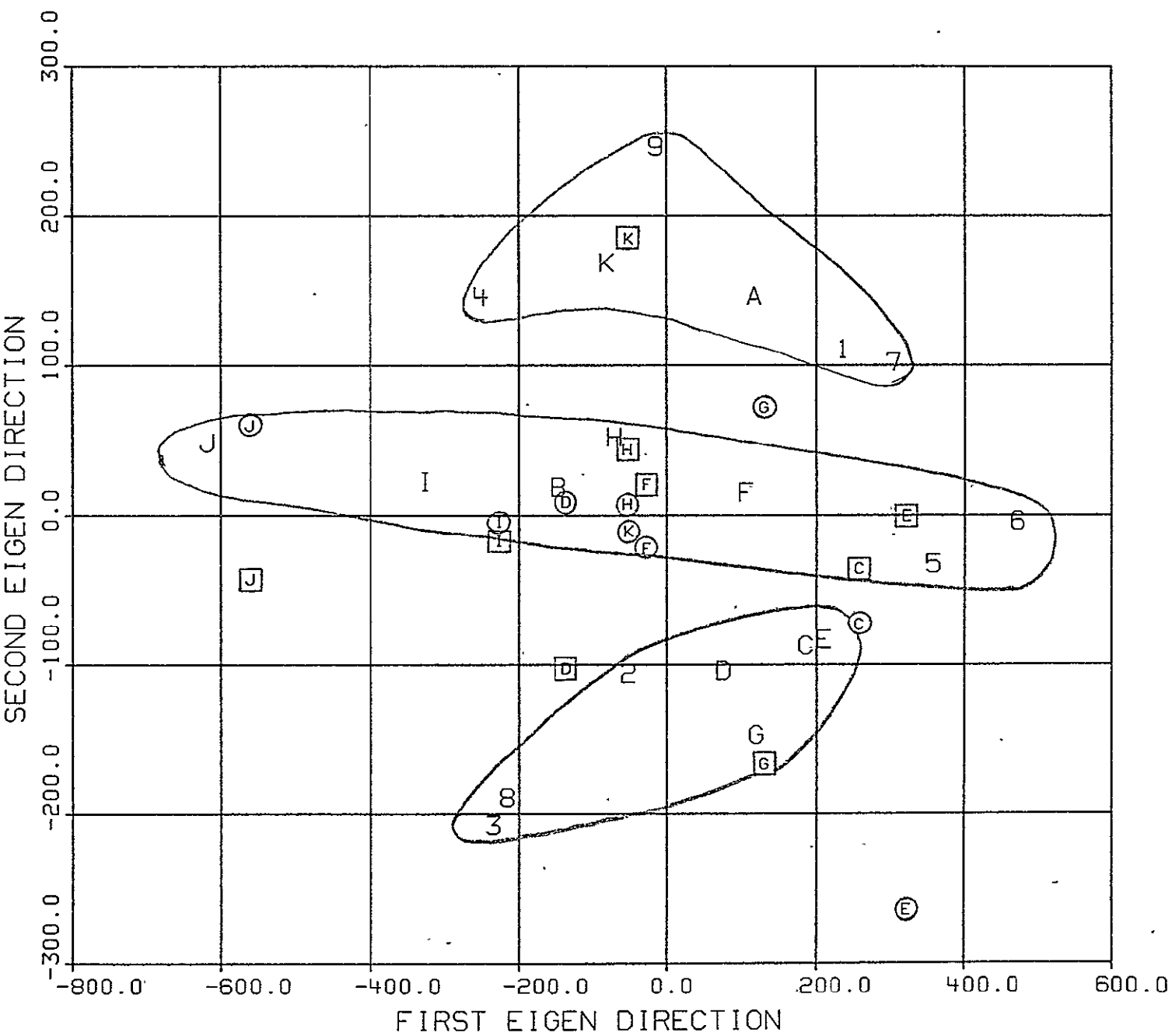
to include as large a span of history in the construction of the algorithm as possible. Thus, for the maximum history estimates if predictor vectors give similar performance but one of them is based on a larger time span the preference will be given to the algorithm developed over the larger time span. The maximum history estimates use only the sunspots from Cycles 1 through 20 to estimate the second, third and fifth coefficients. The modern biased philosophy assumes the character of the sunspot cycles is slowly changing in a non-periodic fashion and thus, the more recent sunspot cycles are likely to be better predictors than the earlier sunspot cycles. This philosophy suggests it is best to use the modern sunspot predictors for coefficient 2 and 3 and the combined predictor vector for coefficient 5.

The analysis of the eigenvector expansion discussed in the preceding section suggested that there have been significant changes in the second, third and fifth eigenvectors over the last two centuries. However, it was also shown that throwbacks are possible and the possibility that this phenomenon is periodic can not be ruled out. In fact, several studies (5) have suggested a periodicity of 180 years in the sunspot cycles. Thus, we can not at this position rule out either of these philosophies for estimating the sunspot cycle.

Analysis of the estimated and actual coefficients for the sunspot cycles was performed in order to 1) arrive at estimates of the expected accuracy of the predictions and 2) to attempt to shed light on the decision between the maximum history estimate and the modern biased estimate. This analysis was performed in the eigenvector space. This was accomplished by comparing the eigenvector projections of the estimated and the actual coefficients. For the first two eigendirections, this is equivalent to adding the maximum history and modern biased estimates to Figure 8. This has been done in Figure 9 where the maximum history and modern biased estimates of the most recent 11 sunspot cycles are the smaller symbols circumscribed with circles and squares, respectively.

To evaluate the difference between the maximum history estimate and the modern biased estimate when both magnetic and sunspot data is available, the second direction shown on Figure 9 and the third and fifth directions obtained from similar plots were analyzed in detail to determine how many of the coefficients were estimated better under each of the two assumptions. This study showed, that for the second and third

FIGURE 9 - COMPARISON OF ESTIMATED USING MAGNETIC DATA AND ACTUAL PROJECTIONS ON EIGEN DIRECTIONS (○ MAX HISTORY ESTIMATE, □ MODERN BIAS ESTIMATE)



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coefficients the modern biased philosophy was better in a ratio of 2 to 1. However, it is interesting to note, that the maximum history approach was better for some of the more recent cycles. This indicates that although the modern biased estimate may be slightly better on the average, there are exceptions. For the fifth coefficient, both philosophies performed approximately equally well.

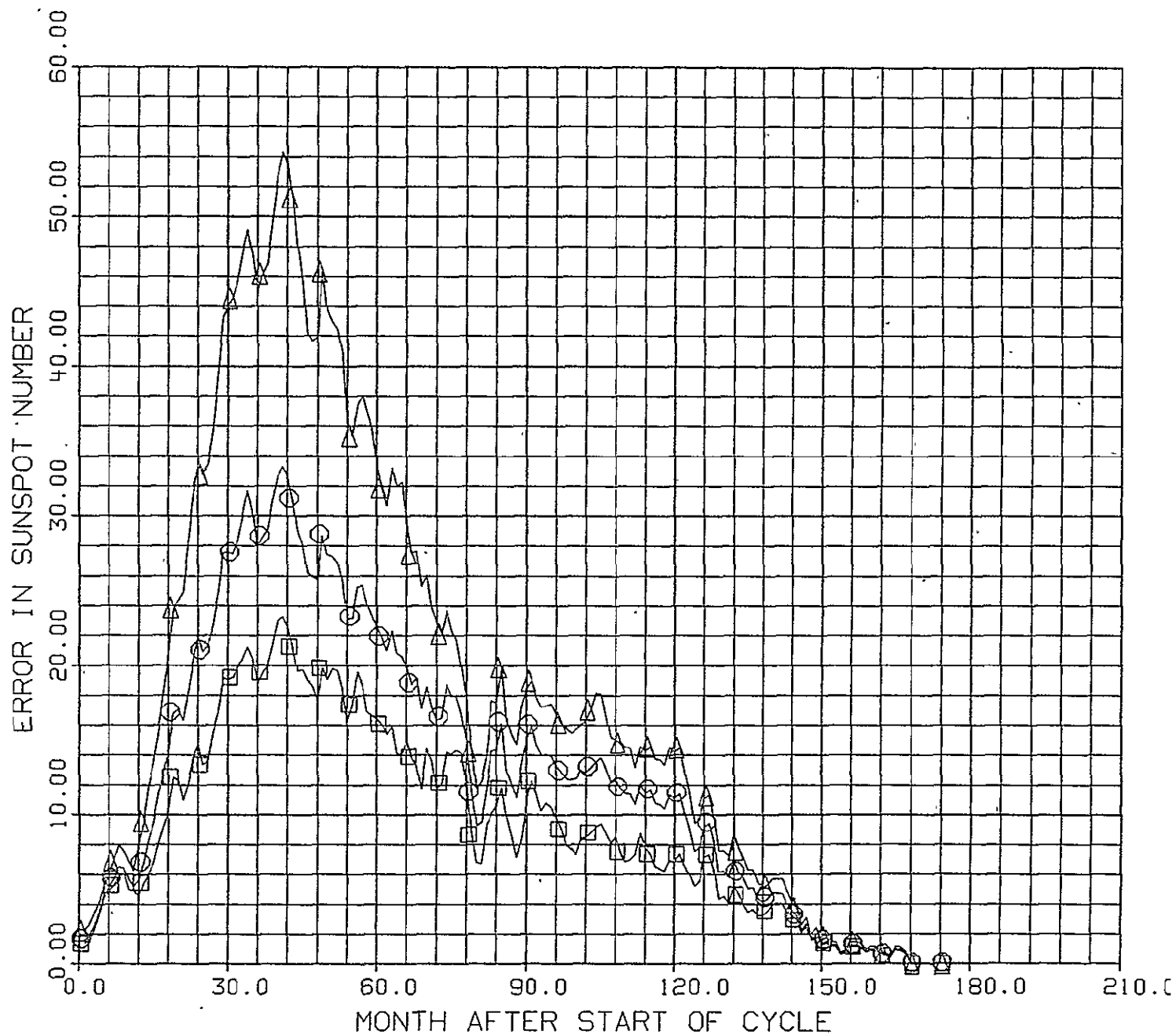
It is also important to consider the capability to estimate future sunspot cycles if the magnetic data is not available, this is because we have not at present developed a technique to forecast the magnetic data for the next cycle. Thus, the approach that is used in this paper to obtain estimates for Cycle 21 and 22 consists of using the magnetic and sunspot data just discussed to estimate Cycle 21 and then combine the estimate of sunspot Cycle 21 with the available actual sunspot numbers for Cycles 21 and 20 to make a sunspot only estimate of Cycle 22. For the sunspot only estimate, the modern biased philosophy uses the modern sunspot only algorithms to estimate the second and third coefficients. The complete sunspot only predictors are used for the remaining coefficients. The complete sunspot only predictors are used for all six coefficients for the maximum history predictions. Comparison of the performance of these two philosophies for the sunspot only predictions shows that for the first and fourth coefficients maximum history and the modern biased philosophies are each best for about half of the cases, but the modern biased is better by a ratio of 2 to 1 for the second and third coefficients as it was in the case of the magnetic and sunspot prediction.

The inverse of the eigenvector transformation may be used to transform the expected errors in the coefficient to an expected error in sunspot number. This has been done for the expected two sigma errors using the sunspot only, the magnetic plus sunspot predictors and using the mean cycle as a predictor of the next cycle. Although these errors were calculated using both the max history and modern biased philosophies, the difference between these two philosophies was insignificant and only the modern bias values are plotted in Figure 10 for the sunspot plus magnetic estimate and only the maximum history is plotted for the sunspot only predictors. These two are plotted because they are the recommended philosophies for predicting Cycles 21 and 22, respectively. This recommendation is based on the preceding discussion which

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FIGURE 10 - EXPECTED 2-SIGMA ERRORS IN SUNSPOT PREDICTION METHODS

$\triangle$ =MEAN-CYCLE-PREDICTION, $\circ$ =SUNSPOT-ONLY PREDICTORS, $\square$ =MAGNETIC+SUNSPOT-PREDICTORS



suggests a mild preference for the modern biased estimates. Thus, everything being equal as was the case for the Cycle 21 estimates which were very similar for the modern biased and max history philosophies we choose the modern biased philosophy. For the case of Cycle 22, the modern biased estimate led to significant numbers of negative sunspots near the end of the cycle and thus, it was decided to use the maximum history philosophy which provided positive sunspot numbers throughout the entire length of the forecast cycle. These conclusions are summarized in Columns 9 and 10 of Table 2.

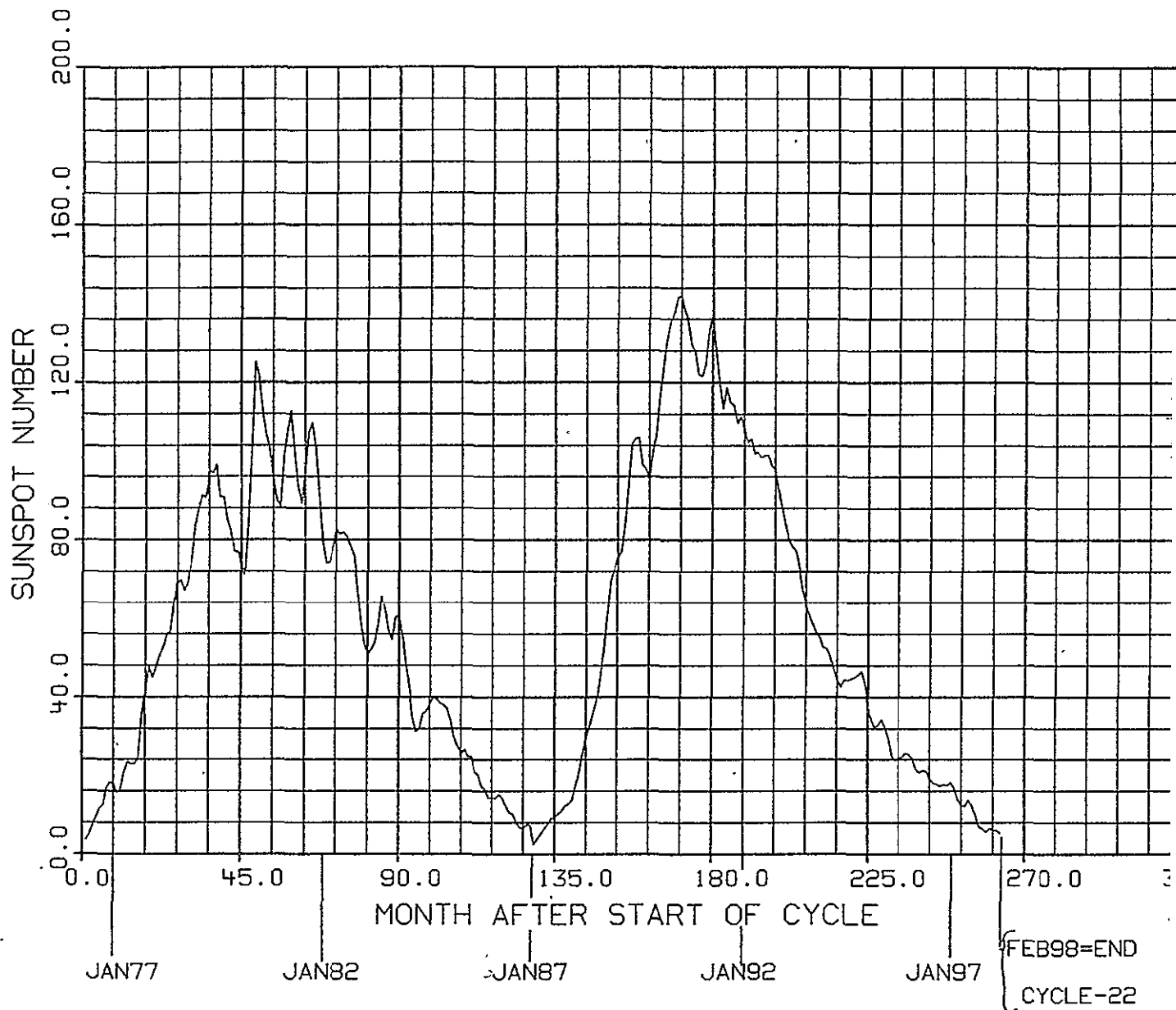
A more detail understanding of these errors can be obtained by reviewing the comparison of the predicted and actual cycles presented in Appendix B. These predictions were all derived with the sunspot cycle being predicted, removed from the data set, i.e. using the one-out test (6) procedure.

5.0 PREDICTION FOR CYCLES 21 and 22

The procedures developed and discussed in the preceding section were used to estimate the sunspot numbers for Cycles 21 and 22. The estimates which have the highest probability of being correct are the modern biased estimate using both the sunspot and magnetic data to estimate Cycle 21 and the maximum history estimate using only the sunspot data to estimate Cycle 22. These two estimates have been plotted in Figure 11. These estimates are also the estimates which are shown for Cycles 21 and 22 on Figure 6. These estimates show Cycles 21 and 22 to be more like Cycle 20 than like Cycles 18 and 19. That is, peak sunspot numbers are expected in the range of approximately 120 and 140 for sunspot Cycles 21 and 22, respectively.

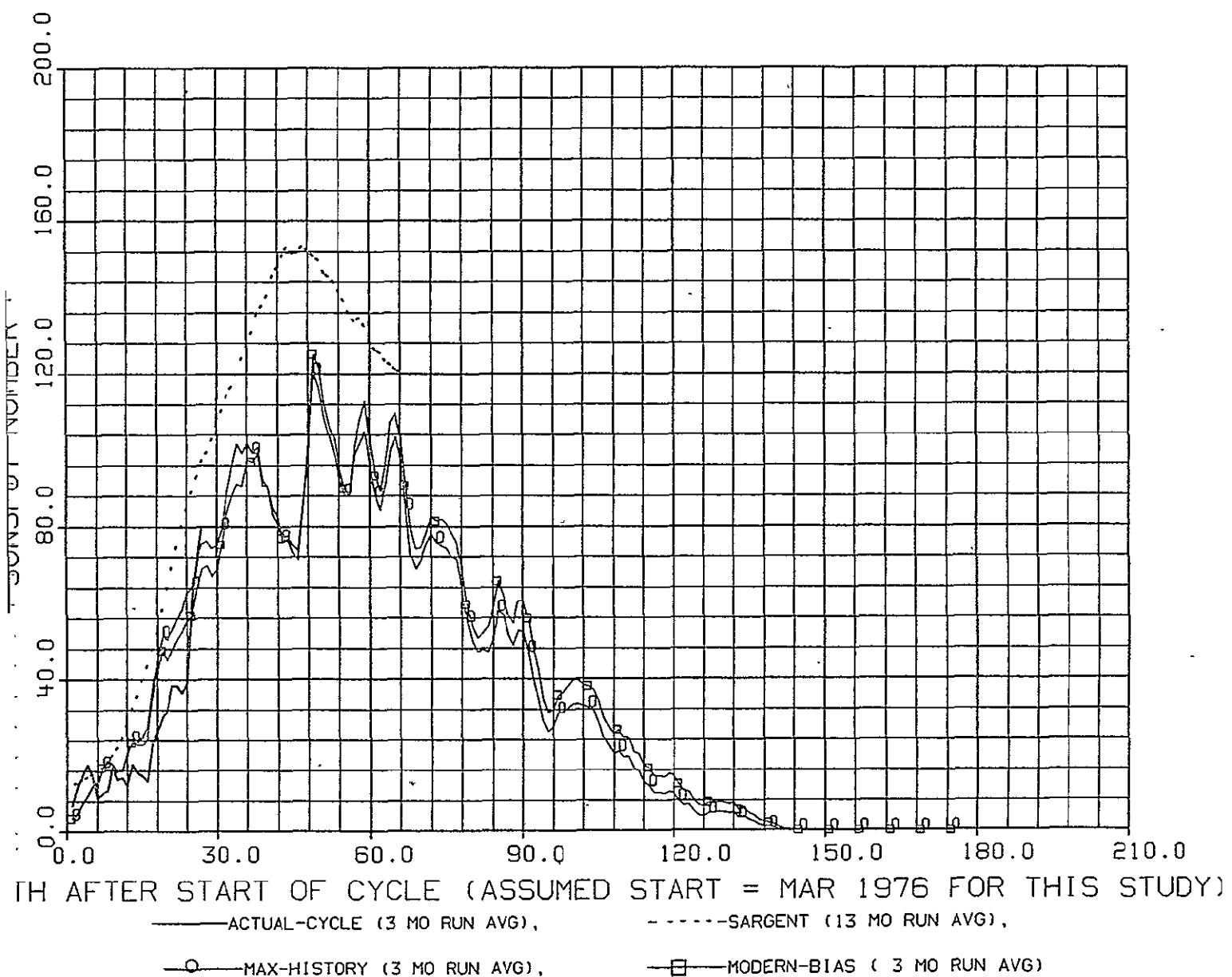
Figure 12 presents a comparison of the maximum history and modern bias estimates of Cycle 21 using both the sunspot and magnetic data with the prediction made by Sargent (4). Note, that Sargent's predictions are for the 13 month running mean assigned to the mid point and the ADAPT predictions are for a 3 month running average assigned to the end point. This figure also shows the actual sunspot Cycle 21 through April of 1978. This figure shows that the ADAPT forecasts for Cycle 21 are significantly below that of Sargent's, especially for the last three quarters of 1979 and the first quarter of 1980. It is also interesting to note, that up to this point the ADAPT estimates are doing a reasonable job of predicting the occurrence of the small scale structure. Sunspot only estimates for Cycle 21 gave a low estimate for the sunspot cycle with the peak sunspot number of only 80. Examining previous sunspot only estimates shows a number of cases where low estimates occur which may be explained by an inability of the sunspot only estimates to correctly predict a great deal of small scale structure occurring during the peak period. This is exactly the behavior that the sunspot plus magnetic estimates predict for Cycle 21. That is, if we drop the small scale structure occurring between month 30 and 66, one notes that the peak sunspot number would be approximately 80. Thus, we feel quite confident in stating that the sunspot only estimate is probably not correct for this cycle and one should use the sunspot plus magnetic index estimate. This is further verified by comparisons over the preceding 20 cycles (see Appendix-B) for which the sunspot plus magnetic

FIGURE 11 - RECOMMENDED ESTIMATE OF 3 MONTH
RUNNING AVERAGE SUNSPOT NUMBER FOR CYCLES 21 + 22



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FIGURE 12 - COMPARISON OF ADAPT AND
SARGENT ESTIMATES OF SUNSPOT CYCLE 21



estimate has always been better when there has been a significant difference between the two estimates. This is also confirmed by the early data of the present cycle which is also much closer to the estimate presented in Figure 12. then the estimate using the sunspot only predictor.

Since there appears to be considerable difference between the Sargent estimate and the ADAPT estimate it is useful to inquire whether these two procedures at least use the AA magnetic data in the same way. Since different averages are predicted, the comparison must be with respect to the large scale structure of the sunspot cycle, which is defined by the first three terms of the eigen vector expansion. For the ADAPT predictions shown in Figure 11, the AA magnetic data was only used for the first of these. This of course is dominant for predicting the large scale shape of the sunspot cycle. Table 2 showed that the AA magnetic index had no prediction capability using the available training data for the third coefficient. The relative importance vectors for estimating the first and second coefficient are presented in Figures 13A and B, respectively. In these figures, the region of the AA magnetic index which was used in the Sargent method has been shaded. It is disturbing to note, that this shaded region contains both positive and negative relative importance. This is disturbing because the Sargent method is based on the conclusion that this entire region behaves in the same manner; namely, that large magnetic activity during this region of the magnetic cycle produces larger than normal peak sunspots in the next cycle. Unfortun-

FIGURE 13A - RELATIVE IMPORTANCE OF MAG AA-INDEX TO ESTIMATE OF FIRST COEFFICIENT OF EIGENVECTOR EXPANSION OF SUNSPOT CYCLE

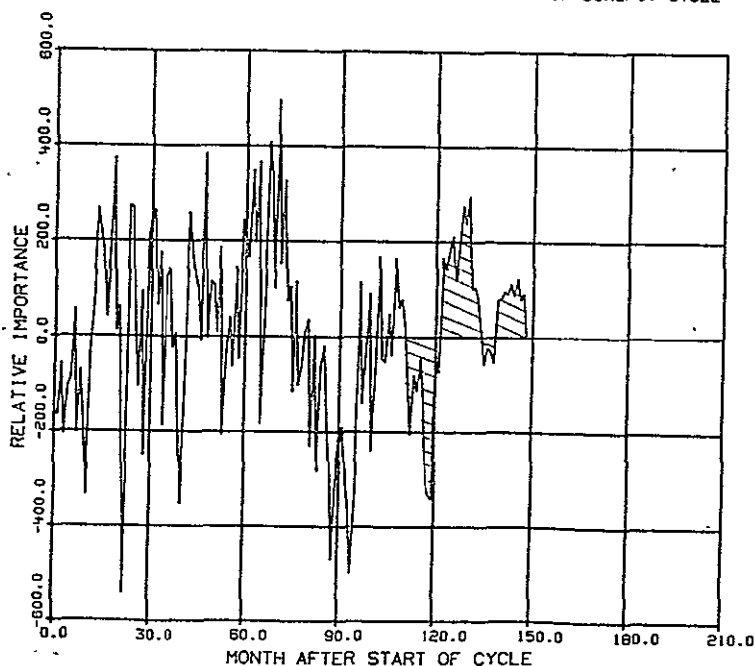
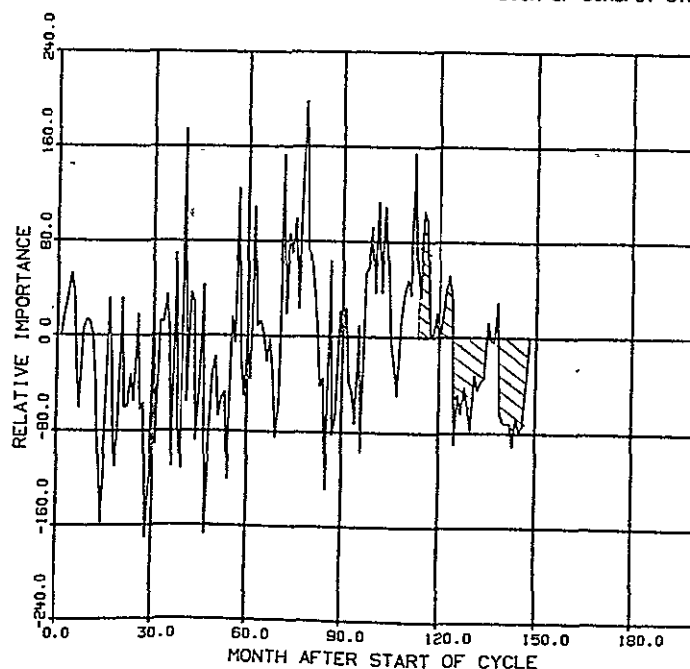


FIGURE 13B - RELATIVE IMPORTANCE OF MAG AA-INDEX TO ESTIMATE OF SECOND COEFFICIENT OF EIGENVECTOR EXPANSION OF SUNSPOT CYCLE



ately, these algorithms suggest that this is an oversimplification and that a more detail interpretation of behavior in this region is required. However, if one were to use the period from 7 to 10 years after the beginning of the cycle (which is equivalent to the last three years of a short cycle), this relative importance vector would be in qualitative agreement with the Sargent method since the negative relative importance multiplied by a greater than average magnetic activity will give a large negative first coefficient which combined with Figure 7C implies greater than average sunspots.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The studies and analyses which are reported in this report have led to new predictions for the sunspot numbers expected to occur during Cycles 21 and 22 over the period from 1976 through 1998. It is believed that these estimates are the most reliable made to date. Studies have also led to the following specific conclusions:

1) Both the preceding sunspot activity over the preceding two cycles and the AA magnetic index appear to have predictive value for forecasting future sunspot activity. Using both of these predictors to predict the first six coefficients of the eigenvector expansion of the sunspot cycle, one should expect maximum errors in the reconstruction of the next cycle to be approximately 20 sunspot numbers occurring near the region approximately $3\frac{1}{2}$ years after the beginning of the cycle. Significantly smaller errors will occur at the early and late portions of the cycle. These accuracies are based on the assumption that no gross changes such as the Maunder minimum occur over the time of the predictions. If the sunspot numbers for the preceding two cycles are used by themselves to make the predictions the maximum error increases to approximately 30 sunspot numbers. A comparison of the predictions made using the combination of the magnetic plus sunspot data with the sunspot data only has shown that whenever there is a significant difference between the two predictors, the magnetic plus sunspot has proved the better of the two.

2) The dominant variation in sunspot cycles as defined by the first eigenvector has remained essentially constant over the past two centuries. But the variation as defined by the second through fourth eigenvectors although apparently measured with sufficient accuracy to allow its prediction during the early sunspot cycles has changed in character during the modern period. However, we have also seen that throwbacks to the early sunspot cycle characteristics do occur. Finally, some of the information such as that characterized by the fifth and sixth eigenvectors was probably not measured with sufficient accuracy in the early cycles.

3) The new predictions for Cycle 21 show it to be quite similar to the mean cycle having an early peak of approximately 100 occurring $3\frac{1}{2}$ years after the start of the cycle or about

September 1979 followed by a local minimum 6 month later between 70 and 75 after which it will rapidly rise to the peak value of 120 in the Fall of 1980. The prediction for Cycle 22 shows that it should have a slightly greater magnitude than Cycle 21.

4) Examination of the relative importance vectors showed that the mechanism used in the present predictions was not the same as that proposed by Sargent for use of the magnetic data to predict the future sunspot cycles, although for short cycles the present approach may use the same mechanism as the Sargent estimates.

Based on the results of this study, the following additional work is recommended:

1) That the mechanism of Sargent be specifically investigated by rederiving the algorithms to estimate the future sunspot cycle using only the last three years of the AA magnetic index and years 7-10 as a predictor.

2) That extrapolation algorithms based on three cycles similar to those developed in 1972 be developed both for peak to peak and minimum to minimum extrapolations. These should be developed both with and without the AA magnetic vector.

3) That analysis similar to the present study be performed to predict pairs of cycles rather than individual cycles.

4) That the ADAPT analysis techniques be used to develop short term prediction techniques. The suggested approach to this is to develop a short term algorithm for estimating the deviation of the present sunspot number from the mean cycle over a few years following the general approach originally used by McNish.

5) It is recommended that a study be performed on the period of the sunspot cycles. This study would be directed towards defining the shapes of the minimum and the maximum and using these characteristic shapes to better determine the period of the sunspot cycles.

6) It is recommended that the ADAPT techniques be used to further investigate the possibility of increasing the historical representation of the sunspot number. This would require the development of algorithms to backward forecast and to reconstruct cycles from which partial data is available. It would also be useful to develop algorithms providing objective correlations of the sunspot cycle with quantities which are available over long historical periods such as the carbon 14 content of tree rings.

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- 3) Eddy, John A., "The Case of the Missing Sunspots", Scientific American 236:15, May 1977, pp 80-92.
- 4) Sargent, H.H., "A Prediction for the Next Solar Cycle", Presented at IEEE Vehicular Technology Conference, March 1978.
- 5) Jose, P.D., "Suns Motion and Sunspots", Astron J., 70 1965, pp 193-200.
- 6) Lochenbruch and Mickey, "Estimation of Error Rates in Discriminant Analysis", Technometrics, Vol 10, No. 1, Feb. 1968, pp 1-11.

APPENDIX A

PREDICTION ALGORITHMS

This appendix presents the algorithms required to make the predictions of the future sunspot period based on the magnetic index or based on the preceding sunspot numbers. It also presents the algorithms required to estimate the future sunspot cycle based on the preceding sunspot numbers and magnetic index.

Estimate of Sunspot Period

Tables A1 and A2 present the algorithms for estimating the period of the next sunspot cycle from the current magnetic index, AA(I) or/and the present and preceding cycles sunspot number, SS(I), respectively. These tables give equations for estimating the period and then the algorithm values required. Note, that in all cases, each of the parts of the data vector has been normalized by its own square magnitude and thus one must calculate the square magnitude and divide its square root into the product of the algorithm vector and the data vector when applying the algorithm. If one inserts the AA magnetic index for Cycle 20 into equation given by Table A1, one should obtain the answer for the period of 127.4 months. Similarly, if one inserts the three month running average of the monthly mean sunspot number for Cycles 19 and 20 into index values of 1 through 180 and 181 through 360 of the equations given by Table A2, one should obtain a value of 145.3 as the period of Cycle 21.

The SALG values given in Tables A1 and A2 have been presented as relative importance vector plots in Section 2.0 of the main body of the report.

Algorithms for Estimating the Sunspot Number

The estimate of the sunspot number for Cycle N is given by the following equation:

$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

where:

SS(I) equals the predicted sunspot number for month I

SSB(I) equals sunspot number from the mean cycle for month I (given in Table A-3)

COEF-K the coefficient of the K^{th} term in the eigen vector expansion for the cycle to be predicted (Cycle N)

HK(I) equals the value of the K^{th} eigen vector for month I

The values for the mean sunspot cycle, SSB(I) are given by Table A3 and are plotted in Figure 7A of the main body of the report. Tables A4 through A15 given the algorithms for calculating coefficients of the first six eigenvectors in the eigenvector expansion of the sunspot cycles, COEF-K, for the modern biased and maximum history philosophies. These tables have exactly the same formats as the two tables for predicting the sunspot period given in Tables A1 and A2. In these tables, the Symbol AA(I) stands for the AA magnetic index during the preceding sunspot cycle. The symbol SN(I) is for the sunspot numbers during the two preceding cycles with indices 1-180 associated with Cycle N-2 and indices 181-360 associated with Cycle N-1. The symbol C(I) is the combination of sunspot numbers and AA magnetic index during the preceding cycle. This vector consists of the sunspot numbers for the three month running average of the monthly mean of the sunspot number for the preceding two cycles. However, these cycles are reversed from the SN vector and indices 1-180 are associated with Cycle N-1 and indices 181-360 with Cycle N-2. This provides index points 0 through 360. Index points 361 through 540 are the AA magnetic index for the preceding cycle and points 541 through 558 are the yearly running sunspot average for the sunspot cycle occurring 180 years prior to the one being predicted. Figures A1 through A12 present plots of the SALG values or relative importance vector for estimating first six coefficients which are given in Tables A4 through A15.

Eigenvectors, HK(I) to be used in the equation for estimating the future sunspot number are given in Tables A16 through A21. These eigenvectors were also plotted in Figures 7C through 7I in the main body of the report.

Sample Calculation

Table A-22 is used for the sample calculation of the modern biased estimate of Cycle 21. Table A-22 presents the AA-magnetic data for Cycle 20 which is used to predict the first coefficient, $COEF_1$.

The title of Table A-22 illustrates how one obtains a value of $COEF_1 = -31.25$. The values which should be obtained for $COEF_6$ using Tables A-22 and A-15 in a similar manner is -28.95 . $COEF_2$ and 3 using the Cycle 19 and 20 sunspots instead of Table A-22 and Tables A-7 and A-9, respectively are 36.2 and -8.77 . Using the combined data vector and Tables A-11 and A-13, respectively, one should get $COEF_4 = 77.4$ and 5 = 17.1.

FIGURE A1 - RELATIVE IMPORTANCE OF SUNSPOT NUMBER FOR ESTIMATING FIRST COEFFICIENT

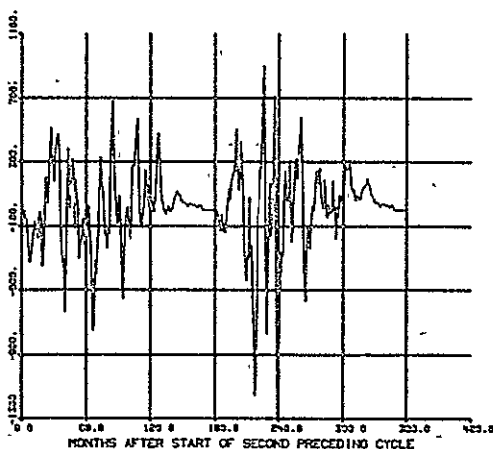


FIGURE A2 - RELATIVE IMPORTANCE OF AA-MAGNETIC INDEX FOR ESTIMATING FIRST COEFFICIENT

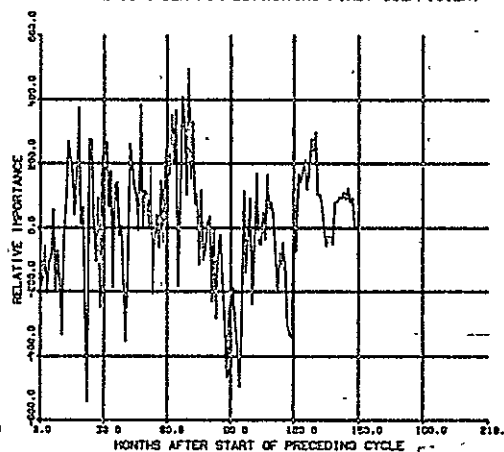


FIGURE A3 - RELATIVE IMPORTANCE OF SUNSPOT NUMBER FOR ESTIMATING SECOND COEFFICIENT

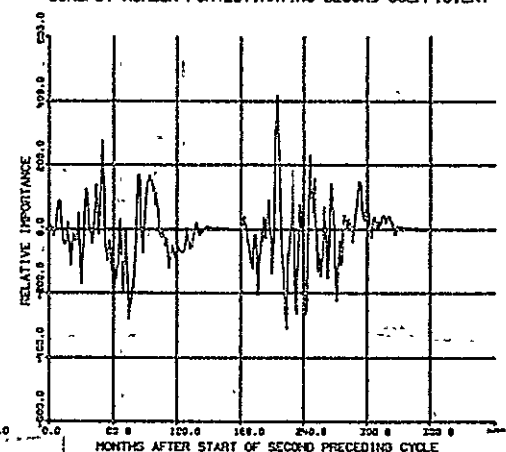


FIGURE A4 - RELATIVE IMPORTANCE OF MODERN
SUNSPOT NUMBER FOR ESTIMATING SECOND COEFFICIENT

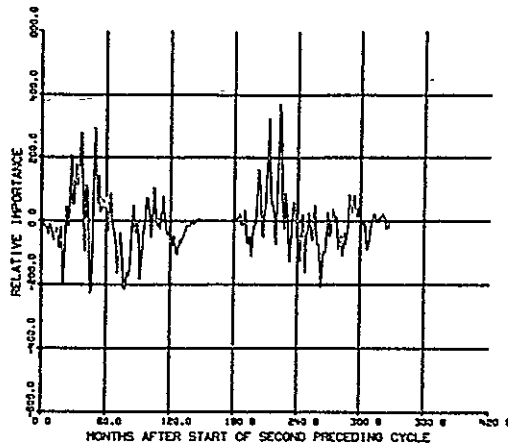


FIGURE A5 - RELATIVE IMPORTANCE OF
SUNSPOT NUMBER FOR ESTIMATING THIRD COEFFICIENT

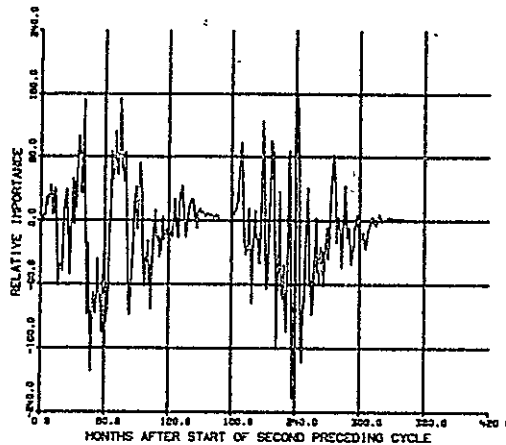


FIGURE A6 - RELATIVE IMPORTANCE OF MODERN
SUNSPOT NUMBER FOR ESTIMATING THIRD COEFFICIENT

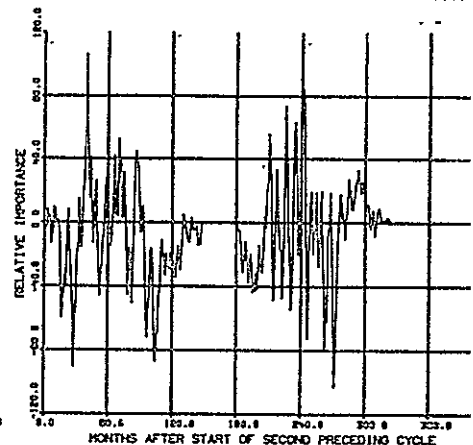


FIGURE A7 - RELATIVE IMPORTANCE OF
SUNSPOT NUMBER FOR ESTIMATING FOURTH COEFFICIENT

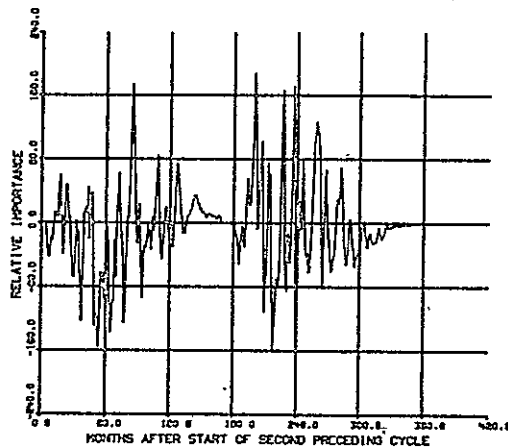


FIGURE A8 - RELATIVE IMPORTANCE OF
COMBINED VECTOR FOR ESTIMATING FOURTH COEFFICIENT

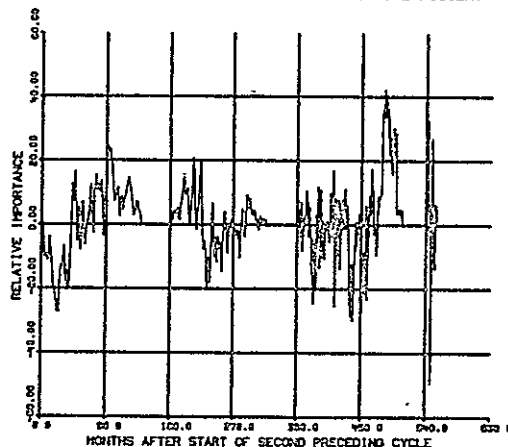


FIGURE A9 - RELATIVE IMPORTANCE OF
SUNSPOT NUMBER FOR ESTIMATING FIFTH COEFFICIENT

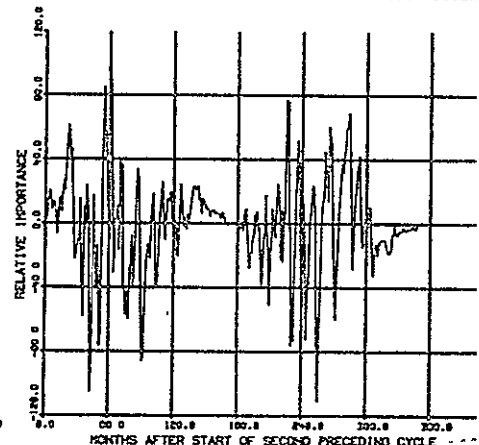


FIGURE A10 - RELATIVE IMPORTANCE OF
COMBINED VECTOR FOR ESTIMATING FIFTH COEFFICIENT

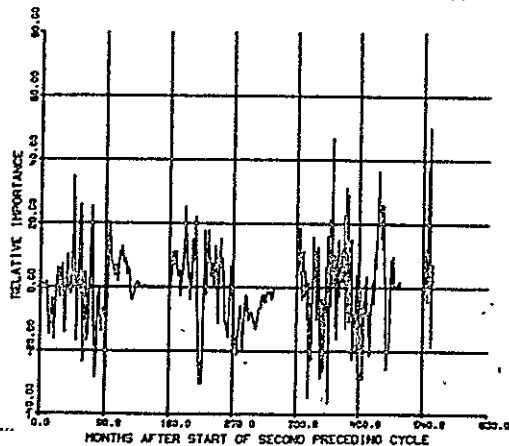


FIGURE A11 - RELATIVE IMPORTANCE OF
SUNSPOT NUMBER FOR ESTIMATING SIXTH COEFFICIENT

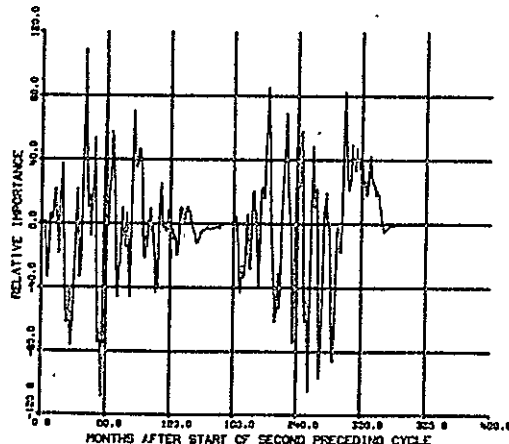


FIGURE A12 - RELATIVE IMPORTANCE OF
AA-MAGNETIC INDEX FOR ESTIMATING SIXTH COEFFICIENT

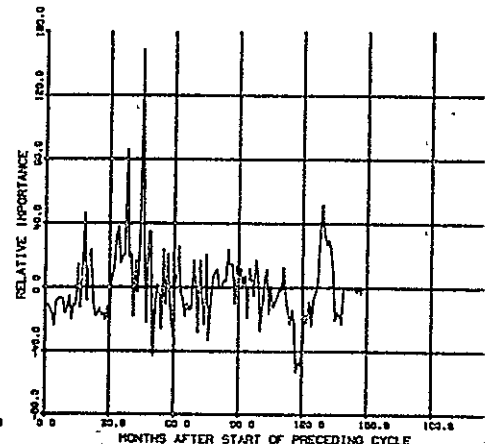


TABLE A-1
ALGORITHM FOR ESTIMATING PERIOD OF NEXT SUNSPOT CYCLE FROM PRECEDING
MAGNETIC INDEX (AA)

$$\text{PERIOD} = 131.76 + \left(\sum_I \text{SALG}(I) * \text{AA}(I) \right) / \sqrt{\sum_I \text{AA}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	-0.7306690E 00	2	-0.3539717E 01	3	-0.3857058E 01	4	-0.3636206E 01
5	-0.4092207E 01	6	0.8253148E 00	7	0.1612103E 01	8	0.5624981E 00
9	-0.1885765E 01	10	-0.3993237E 01	11	-0.5310207E 01	12	-0.1679590E 00
13	0.1560314E 01	14	-0.1894239E 01	15	-0.5045454E 01	16	-0.7739773E 01
17	-0.1361467E 02	18	0.1287473E 02	19	-0.1201423E 01	20	0.1335922E 01
21	-0.5608388E 01	22	0.1504996E 01	23	0.1600349E 02	24	0.1079798E 02
25	-0.1334284E 01	26	0.1394534E 01	27	-0.8978201E 01	28	-0.4015396E 01
29	-0.4110602E 01	30	-0.6875787E 01	31	0.1257454E 02	32	-0.6090592E 01
33	0.5427879E 01	34	0.1605404E 01	35	0.2376815E 01	36	0.4675297E 01
37	-0.8574934E 00	38	0.2114128E 02	39	-0.4985197E 01	40	-0.3262000E 01
41	-0.3782029E 01	42	0.3039836E 01	43	0.3975411E 01	44	0.6203112E 01
45	0.4034343E 02	46	0.5559643E 01	47	0.9441157E 01	48	0.1532810E 02
49	0.1064626E 02	50	0.3923820E 01	51	-0.1168846E 02	52	0.1031823E 02
53	0.8220924E 01	54	-0.2681077E 01	55	-0.7307501E 00	56	-0.2545100E 01
57	-0.7859903E 01	58	-0.1185451E 02	59	-0.3554101E 01	60	0.2548095E 01
61	0.9966271E 00	62	0.1576722E 01	63	-0.6679765E 01	64	-0.5979246E 01
65	-0.1165642E 02	66	-0.9042594E 01	67	-0.2884088E 01	68	0.5385942E 00
69	-0.1485098E 02	70	-0.1048469E 02	71	-0.2643185E 00	72	-0.6290476E 01
73	0.2701180E 01	74	0.5376024E 01	75	0.5435629E 00	76	-0.1632172E 02
77	-0.9095544E 01	78	0.6331704E 01	79	0.1267329E 02	80	-0.7327936E 01
81	-0.5525892E 01	82	-0.1420270E 02	83	0.1473938E 01	84	-0.3927929E 01
85	0.1889822E 02	86	0.9415558E 01	87	-0.1272113E 01	88	-0.1526641E 02
89	-0.3738389E 01	90	0.2531758E 01	91	0.3634911E 01	92	0.7047078E 01
93	0.5496221E 01	94	-0.5084322E 01	95	-0.1696105E 01	96	-0.1823934E 01
97	0.2611266E 01	98	0.1370497E 02	99	0.2474169E 01	100	-0.7279449E 01
101	-0.9338407E 01	102	0.4608417E 01	103	0.9902756E 00	104	-0.1055365E 02
105	-0.9980489E 01	106	-0.1008092E 02	107	-0.5327473E 00	108	0.1460662E 01
109	0.9122496E 00	110	0.9431867E 00	111	0.7515525E 01	112	0.1439350E 01
113	-0.3385970E 01	114	0.1752318E 01	115	0.3077361E 01	116	0.4162758E 01
117	0.9505949E 00	118	0.5338920E 00	119	-0.9302790E 01	120	-0.3389508E 01
121	-0.2339962E 01	122	-0.1406250E 00	123	-0.3184093E 01	124	-0.6230261E 01
125	-0.2523699E 01	126	-0.1976237E 01	127	0.8159828E 00	128	-0.1066796E 01
129	0.7272516E 01	130	-0.2973657E 01	131	0.3561839E 01	132	0.4353192E 01
133	0.3002478E 01	134	0.6064243E 01	135	-0.7256776E 01	136	-0.5306801E 01
137	-0.6324583E 01	138	-0.5336802E 01	139	-0.6681390E 00	140	-0.1385773E 01
141	-0.3610995E 00	142	-0.6836311E 00	143	-0.1100865E 01	144	-0.2951710E 00
145	0.9772520E 00	146	-0.1769807E 01	147	0.2843031E 01	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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TABLE A-2
ALGORITHM FOR ESTIMATING PERIOD OF NEXT SUNSPOT CYCLE FROM PRECEDING
SUNSPOT NUMBER (SN)

$$\text{PERIOD} = 190.78 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.1470106E 01	2	0.6632775E-01	3	0.2257900E-01	4	-0.7122796E 01
5	-0.1016062E 02	6	-0.1248692E 02	7	-0.5853694E 01	8	0.1622871E 01
9	0.3462885E 01	10	0.3964429E 01	11	0.1416450E 01	12	0.3175563E 01
13	0.3911546E 01	14	-0.1205399E 01	15	-0.7959717E 01	16	-0.1436182E 02
17	-0.3221257E 01	18	-0.3761947E 01	19	-0.5432552E 01	20	-0.1513255E 02
21	-0.8856971E 01	22	-0.8357648E 01	23	-0.1238051E 02	24	-0.1575797E 02
25	-0.1459930E 02	26	-0.9757486E 01	27	-0.9473774E 01	28	-0.4354136E 01
29	-0.1919600E 01	30	0.3095729E 00	31	0.3259417E 01	32	0.6915418E 01
33	0.1094482E 02	34	0.8375069E 01	35	0.3616838E 01	36	0.3804741E 01
37	0.5898778E 01	38	0.1487580E 02	39	0.2507399E 02	40	0.3112619E 02
41	0.1755943E 02	42	0.1131503E 02	43	0.9518845E 01	44	0.1292082E 02
45	-0.2172177E 01	46	-0.1607936E 02	47	-0.1470732E 02	48	0.4853375E 01
49	0.1689935E 02	50	0.8108312E 01	51	-0.1480949E 02	52	-0.2761375E 02
53	-0.2335037E 02	54	-0.2265678E 02	55	-0.3124960E 02	56	-0.3678209E 02
57	-0.2438560E 02	58	0.7236452E 01	59	0.2250513E 02	60	0.1938586E 02
61	0.6613559E 01	62	-0.2283232E 00	63	0.4241290E 00	64	0.4003881E 01
65	0.6399182E 01	66	0.1113561E 02	67	0.6399298E 01	68	0.3272054E 01
69	-0.1066076E 02	70	-0.1815933E 02	71	-0.1768964E 02	72	-0.1358030E 02
73	-0.1313089E 02	74	-0.7233401E 01	75	-0.3779181E 01	76	-0.9814549E 01
77	-0.1114795E 02	78	-0.1558961E 02	79	-0.3237234E 01	80	-0.9154655E 01
81	-0.1296699E 02	82	-0.1677107E 02	83	-0.4260870E 01	84	0.9538122E 01
85	0.9238256E 01	86	0.2996545E 00	87	-0.9799277E 00	88	0.4318209E 01
89	0.8932669E 01	90	0.5434734E 01	91	0.7828463E 01	92	0.1099916E 02
93	0.1499849E 02	94	0.1172127E 02	95	0.5277279E 01	96	0.9956656E 00
97	0.6495354E 00	98	-0.6066464E 01	99	-0.2756403E 01	100	-0.4558941E 01
101	-0.4569281E 01	102	-0.1120660E 02	103	-0.1467140E 02	104	-0.1449813E 02
105	-0.8795314E 01	106	-0.5784385E 01	107	0.8099993E 00	108	-0.3705383E 01
109	0.2010045E 01	110	0.8138393E 00	111	-0.1464991E 01	112	-0.3274498E 01
113	-0.1203082E 01	114	0.5123111E 01	115	0.5101989E 01	116	0.3596162E 01
117	0.2932572E 01	118	0.2241112E 01	119	0.1664387E 01	120	0.1848671E 01
121	-0.6791843E 00	122	-0.3521075E 01	123	-0.9279177E 01	124	-0.7549630E 01
125	-0.1509657E 01	126	0.2746393E 01	127	0.2382111E 01	128	0.1095296E 01
129	0.2762083E 01	130	0.2343538E 01	131	0.2560042E 01	132	-0.1081511E 01
133	0.1165827E 01	134	0.1095487E 01	135	0.3734977E 01	136	0.4959204E 01
137	0.5192822E 01	138	0.6404683E 01	139	0.6520612E 01	140	0.6533311E 01
141	0.6021711E 01	142	0.5539866E 01	143	0.5557559E 01	144	0.1600421E 01
145	0.2014233E 01	146	-0.7607040E 00	147	0.2699415E 01	148	0.2463134E 01
149	0.2988999E 01	150	0.1945222E 01	151	0.2245656E 01	152	0.1913547E 01
153	0.1818657E 01	154	0.9726112E 00	155	0.1209833E 01	156	0.1779166E 01
157	0.1802889E 01	158	0.1684278E 01	159	0.1257277E 01	160	0.1470778E 01
161	0.1447056E 01	162	0.1233556E 01	163	0.8540007E 00	164	0.7116670E 00
165	0.1447056E 01	166	0.1375889E 01	167	0.1067500E 01	168	0.9488893E-01
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	0.1581055E 01	182	0.2353157E 01	183	0.1997339E 01	184	-0.1847726E 01
185	-0.7155607E 01	186	-0.1079153E 02	187	-0.9149709E 01	188	-0.5980921E 01
189	-0.7694771E 01	190	-0.8297523E 01	191	-0.1510983E 02	192	-0.7006512E 01
193	-0.8724336E 01	194	-0.1112794E 02	195	-0.1898643E 02	196	-0.1534537E 02
197	-0.6367013E 01	198	-0.6601231E 01	199	-0.1402261E 02	200	-0.1143088E 02

TABLE A-2(Cont.)
ALGORITHM FOR ESTIMATING PERIOD OF NEXT SUNSPOT CYCLE FROM PRECEDING
SUNSPOT NUMBER (SN)

$$\text{PERIOD} = 190.78 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	-0.1245879E 01	202	0.3237624E 01	203	-0.3465985E 01	204	-0.2899176E 01
205	0.4204673E 01	206	0.9145424E 01	207	0.5256441E 01	208	0.9314209E 01
209	0.1103389E 02	210	0.1988293E 02	211	0.2292645E 02	212	0.3666743E 02
213	0.3561792E 02	214	0.3762878E 02	215	0.2619196E 02	216	0.9642942E 01
217	-0.4196543E 01	218	-0.1755759E 02	219	-0.1829518E 02	220	-0.2191208E 02
221	-0.2421814E 02	222	-0.1971214E 02	223	-0.1980112E 02	224	-0.4674232E 01
225	0.1547183E 02	226	0.1930888E 02	227	0.1655818E 02	228	0.3741290E 01
229	0.3827159E 01	230	-0.1079107E 02	231	-0.2002676E 02	232	-0.2740695E 02
233	-0.1980914E 02	234	-0.1218143E 02	235	-0.1321812E 02	236	-0.1969830E 02
237	-0.3401762E 02	238	-0.3641434E 02	239	-0.3290395E 02	240	-0.2399226E 02
241	-0.9263114E 01	242	-0.1113568E 02	243	-0.1115523E 02	244	-0.2642172E 02
245	-0.2264613E 02	246	-0.3609784E 02	247	-0.3532666E 02	248	-0.2762943E 02
249	-0.1740166E 02	250	-0.4108084E 01	251	-0.1180923E 02	252	-0.8378374E 01
253	-0.1309718E 02	254	-0.8431509E 01	255	-0.1732993E 02	256	-0.2651289E 02
257	-0.1935271E 02	258	-0.9279891E 01	259	-0.3576488E 01	260	-0.1846848E 02
261	-0.2489914E 02	262	-0.2999986E 02	263	-0.1819617E 02	264	-0.1364743E 02
265	0.2468185E 01	266	-0.1957195E 01	267	0.4421809E 01	268	-0.3670381E 01
269	-0.5504958E 01	270	-0.1110222E 02	271	-0.1829451E 02	272	-0.1956221E 02
273	-0.2333777E 02	274	-0.1829422E 02	275	-0.8847918E 01	276	0.2933794E 00
277	0.9695738E 01	278	0.6182929E 01	279	0.4325987E 01	280	-0.1259734E 01
281	-0.6746698E 01	282	0.2520994E 01	283	0.1666966E 02	284	0.2691194E 02
285	0.2220592E 02	286	0.1508930E 02	287	0.9018459E 01	288	0.4097901E 01
289	0.6349338E 01	290	0.1103815E 02	291	0.1091060E 02	292	0.5360590E 01
293	0.5261779E 01	294	0.7821114E 01	295	0.1130448E 02	296	0.1182878E 02
297	0.1183793E 02	298	0.9831244E 01	299	0.1074297E 02	300	0.1167253E 02
301	0.1019286E 02	302	0.9571078E 01	303	0.9478516E 01	304	0.6782240E 01
305	0.7259912E 01	306	0.9702390E 01	307	0.1242668E 02	308	0.1262592E 02
309	0.8844327E 01	310	0.9188126E 01	311	0.8638249E 01	312	0.9613283E 01
313	0.7513979E 01	314	0.6502601E 01	315	0.5187797E 01	316	0.5509143E 01
317	0.5547218E 01	318	0.5412337E 01	319	0.4190521E 01	320	0.3191316E 01
321	0.2645289E 01	322	0.3634139E 01	323	0.3501130E 01	324	0.2310467E 01
325	0.2351304E 01	326	0.1694914E 01	327	0.2649732E 01	328	0.1775278E 01
329	0.2196759E 01	330	0.1429636E 01	331	0.1580449E 01	332	0.1336366E 01
333	0.1266627E 01	334	0.7148190E 00	335	0.8891653E 00	336	0.1307594E 01
337	0.1325029E 01	338	0.1237857E 01	339	0.9240344E 00	340	0.1080946E 01
341	0.1063511E 01	342	0.9065995E 00	343	0.6276461E 00	344	0.5230383E 00
345	0.1063511E 01	346	0.1011207E 01	347	0.7845576E 00	348	0.6973845E -01
349	0.0	350	0.0	351	0.0	352	0.0
353	0.0	354	0.0	355	0.0	356	0.0
357	0.0	358	0.0	359	0.0	360	0.0

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TABLE A-3
SUNSPOT VALUES FOR THE MEAN CYCLE (SSB(I))

$$SS(I) = SSB(I) + \sum_K (COEF-K) * HK(I)$$

I	SSB(I)	I	SSB(I)	I	SSB(I)	I	SSB(I)
1	0.2395000E	01	2	0.3684999E	01	3	0.4980000E
5	0.8619999E	01	6	0.1022000E	02	7	0.1186000E
9	0.1314000E	02	10	0.1306000E	02	11	0.1356000E
13	0.1759000E	02	14	0.1895999E	02	15	0.2151999E
17	0.2948499E	02	18	0.3294999E	02	19	0.3624600E
21	0.4163998E	02	22	0.4641499E	02	23	0.5098999E
25	0.5679999E	02	26	0.5973499E	02	27	0.6392499E
29	0.7263998E	02	30	0.7373499E	02	31	0.7610999E
33	0.7788998E	02	34	0.7933499E	02	35	0.8250499E
37	0.8849498E	02	38	0.9426498E	02	39	0.9655499E
41	0.9506999E	02	42	0.9501999E	02	43	0.9443498E
45	0.9076498E	02	46	0.8742499E	02	47	0.9037999E
49	0.9799998E	02	50	0.9932999E	02	51	0.1011500E
53	0.9488498E	02	54	0.8918999E	02	55	0.8379999E
57	0.8857498E	02	58	0.9189499E	02	59	0.9233499E
61	0.8488499E	02	62	0.8171999E	02	63	0.8336499E
65	0.8800499E	02	66	0.8743498E	02	67	0.8405499E
69	0.7726999E	02	70	0.7721498E	02	71	0.7680499E
73	0.7223499E	02	74	0.7001999E	02	75	0.6965999E
77	0.6683998E	02	78	0.6263498E	02	79	0.5817999E
81	0.5239999E	02	82	0.5163498E	02	83	0.5176999E
85	0.5210498E	02	86	0.4888998E	02	87	0.4552498E
89	0.4535498E	02	90	0.4749998E	02	91	0.4758998E
93	0.4203999E	02	94	0.3863998E	02	95	0.3733998E
97	0.3256499E	02	98	0.3145999E	02	99	0.3058499E
101	0.3283998E	02	102	0.3214499E	02	103	0.3020499E
105	0.2541998E	02	106	0.2527499E	02	107	0.2450499E
109	0.2270000E	02	110	0.2112999E	02	111	0.1914999E
113	0.1729498E	02	114	0.1628499E	02	115	0.1512600E
117	0.1421000E	02	118	0.1395000E	02	119	0.1451500E
121	0.1396500E	02	122	0.1278500E	02	123	0.1099500E
125	0.9929998E	01	126	0.1053500E	02	127	0.1004000E
129	0.6754998E	01	130	0.6409998E	01	131	0.5599998E
133	0.5189998E	01	134	0.5409998E	01	135	0.4269999E
137	0.2889998E	01	138	0.2354999E	01	139	0.2695000E
141	0.2974999E	01	142	0.2829999E	01	143	0.2159999E
145	0.1315000E	01	146	0.9049999E	00	147	0.8549999E
149	0.6299999E	00	150	0.4100000E	00	151	0.4749999E
153	0.3850000E	00	154	0.2049999E	00	155	0.2549999E
157	0.3799999E	00	158	0.3550000E	00	159	0.2649999E
161	0.3049999E	00	162	0.2600000E	00	163	0.1799999E
165	0.3049999E	00	166	0.2900000E	00	167	0.2250000E
169	0.0		170	0.0		171	0.0
173	0.0		174	0.0		175	0.0
177	0.0		178	0.0		179	0.0
						4	0.6669999E
						8	0.1285500E
						12	0.1520500E
						16	0.2484999E
						20	0.3631999E
						24	0.5504999E
						28	0.6827998E
						32	0.7453499E
						36	0.8480998E
						40	0.9764499E
						44	0.9283998E
						48	0.9179999E
						52	0.1013350E
						56	0.8591499E
						60	0.9018999E
						64	0.8614499E
						68	0.8007999E
						72	0.7515498E
						76	0.6894499E
						80	0.5488498E
						84	0.5115498E
						88	0.4321498E
						92	0.4466499E
						96	0.3530998E
						100	0.3200998E
						104	0.2698999E
						108	0.2396999E
						112	0.1757999E
						116	0.1413500E
						120	0.1438000E
						124	0.1004500E
						128	0.8459998E
						132	0.6449999E
						136	0.3929998E
						140	0.3064999E
						144	0.1704999E
						148	0.5199999E
						152	0.4050000E
						156	0.3750000E
						160	0.3099999E
						164	0.1500000E
						168	0.2000000E
						-01	

TABLE A-4
ALGORITHM FOR ESTIMATING FIRST COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-1} = 442.39 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	-0.4211795E 02	2	-0.7101145E 00	3	-0.5406927E 02	4	-0.5110614E 02
5	-0.1119174E 03	6	-0.2137671E 03	7	-0.3284805E 03	8	-0.3187703E 03
9	-0.2424961E 03	10	-0.1859139E 03	11	-0.1299439E 03	12	-0.7238545E 02
13	-0.1243576E 03	14	-0.1412648E 03	15	-0.1798044E 03	16	-0.2833820E 02
17	-0.1016711E 02	18	-0.9703204E 02	19	-0.3524395E 03	20	-0.3264727E 03
21	-0.9391956E 02	22	0.2008039E 03	23	0.2026815E 03	24	0.4309891E 02
25	0.1731452E 03	26	0.3687112E 03	27	0.5112021E 03	28	0.3676023E 03
29	0.2856587E 03	30	0.1783068E 03	31	0.3705718E 03	32	0.4055798E 03
33	0.4674392E 03	34	0.4699680E 03	35	0.3027234E 03	36	-0.5211116E 02
37	-0.2600928E 03	38	-0.3170017E 03	39	-0.3608083E 03	40	-0.6366714E 03
41	-0.3071296E 03	42	0.1799273E 03	43	0.3815344E 03	44	0.1830470E 02
45	0.1183000E 02	46	0.3035654E 03	47	0.3187822E 03	48	0.2595361E 03
49	-0.1138403E 03	50	0.1913694E 03	51	0.7336336E 02	52	0.5934348E 02
53	-0.3051958E 03	54	-0.2164215E 03	55	-0.1730880E 03	56	-0.1576782E 03
57	-0.5326978E 02	58	-0.2200421E 03	59	-0.9820792E 02	60	-0.1304827E 03
61	0.1951642E 02	62	0.2567108E 02	63	-0.1216914E 03	64	-0.2360706E 03
65	-0.5467695E 03	66	-0.7509592E 03	67	-0.7127295E 03	68	-0.3166970E 03
69	-0.4011626E 03	70	-0.2292176E 03	71	-0.1222927E 03	72	0.1816781E 03
73	0.3296934E 03	74	0.1318012E 03	75	0.1439930E 03	76	-0.1677032E 02
77	-0.1442566E 03	78	-0.1619771E 03	79	-0.2409787E 03	80	-0.1105271E 03
81	-0.1454533E 03	82	0.3014851E 03	83	0.5673999E 03	84	0.6806919E 03
85	0.3854634E 03	86	0.1303355E 03	87	0.5624547E 02	88	-0.8335381E 02
89	-0.7317564E 02	90	0.8968636E 02	91	0.7913754E 02	92	-0.2636785E 03
93	-0.5039009E 03	94	-0.5543992E 03	95	-0.2198012E 03	96	-0.6500618E 02
97	-0.5733337E 00	98	0.1938141E 02	99	-0.5551802E 02	100	-0.1643941E 03
101	-0.1864724E 03	102	-0.9255090E 02	103	0.2703232E 03	104	0.2746135E 03
105	0.2769238E 03	106	0.4122705E 03	107	0.5304912E 03	108	0.5661284E 03
109	0.1883406E 03	110	-0.1172211E 02	111	-0.9675957E 02	112	-0.1066757E 03
113	0.2055344E 01	114	0.3092099E 02	115	0.2472267E 03	116	0.2201884E 03
117	0.1568300E 03	118	0.2225412E 02	119	0.7164734E 01	120	0.9071080E 02
121	0.2754170E 02	122	0.5207780E 02	123	-0.1063397E 02	124	0.6669246E 02
125	0.2212254E 03	126	0.4260906E 03	127	0.4762610E 03	128	0.3791396E 03
129	0.2020904E 03	130	0.6317529E 02	131	0.5095990E 02	132	-0.6654785E 01
133	0.2567108E 01	134	-0.2601556E 02	135	0.4937134E 01	136	0.2742523E 02
137	0.1436781E 02	138	-0.8904167E 01	139	0.8889496E 01	140	0.9374908E 01
141	0.3724352E 02	142	0.7569479E 02	143	0.8937544E 02	144	0.1174314E 03
145	0.1148704E 03	146	0.9463045E 02	147	0.9270844E 02	148	0.5458832E 02
149	0.6710468E 02	150	0.4367128E 02	151	0.4899548E 02	152	0.4153941E 02
153	0.3940910E 02	154	0.2183562E 02	155	0.2716138E 02	156	0.3994324E 02
157	0.4047580E 02	158	0.3781293E 02	159	0.2822655E 02	160	0.3301973E 02
161	0.3248717E 02	162	0.2769397E 02	163	0.1917276E 02	164	0.1597730E 02
165	0.3248717E 02	166	0.3088943E 02	167	0.2396591E 02	168	0.2130305E 01
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	-0.6196136E 01	182	-0.1237476E 02	183	-0.5814445E 02	184	-0.8491937E 02
185	-0.1308162E 03	186	-0.2880914E 02	187	-0.8668974E 02	188	-0.1230351E 03
189	-0.1394372E 03	190	-0.1019967E 03	191	0.1168164E 02	192	0.7281071E 02
193	0.1345749E 03	194	0.6710638E 02	195	0.1769463E 03	196	0.2084427E 03
197	0.2371229E 03	198	0.2375397E 03	199	0.4936584E 03	200	0.5018838E 03

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TABLE A-4 (CONT.)
ALGORITHM FOR ESTIMATING FIRST COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-1} = 442.39 + \left(\sum_I \text{SALG(I)} \cdot \text{SN(I)} \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	0.2667725E 03	202	0.1223769E 03	203	0.2518964E C3	204	0.4282026E 03
205	0.3177959E 03	206	0.8219954E 02	207	-0.2331773E C3	208	-0.3416519E 03
209	-0.4397212E 03	210	-0.2854429E 03	211	-0.3057942E C3	212	0.7648103E 02
213	-0.2861648E 03	214	-0.2267055E 03	215	-0.5543481E C3	216	-0.7339307E 03
217	-0.1155935E 04	218	-0.1089578E 04	219	-0.6123989E C3	220	-0.3778558E 02
221	0.3305296E 02	222	0.2466122E 03	223	0.1984182E C3	224	0.3828110E 03
225	0.6883259E 03	226	0.8994497E 03	227	0.4449387E C3	228	-0.3387659E 03
229	-0.7686309E 03	230	-0.4570244E 03	231	0.7603532E C2	232	0.1660205E 03
233	-0.1648089E 03	234	-0.7002734E 02	235	0.3099910E C3	236	0.7127937E 03
237	0.6810132E 02	238	-0.7206487E 03	239	-0.1275202E C4	240	-0.1103749E 04
241	-0.5880378E 03	242	-0.4305825E 03	243	-0.2625679E C3	244	-0.2833772E 03
245	0.1931111E 03	246	0.2426960E 03	247	0.8327216E C2	248	0.5671004E 02
249	0.1294942E 03	250	0.2813809E 03	251	0.2788803E C2	252	-0.2017690E 03
253	-0.6589005E 02	254	0.1117581E 03	255	0.3017817E C3	256	0.3190879E 03
257	0.1980264E 03	258	0.3303682E 03	259	0.4529043E C3	260	0.5731741E 03
261	0.3776279E 03	262	0.1330192E 03	263	-0.2500449E C3	264	-0.4438450E 03
265	-0.5694321E 03	266	-0.1968535E 03	267	-0.1064525E C3	268	-0.1633965E 03
269	-0.2422608E 03	270	-0.6612212E 02	271	0.2365459E C2	272	-0.2944336E 01
273	0.4793037E 02	274	0.1838478E 03	275	0.2423453E C3	276	0.1974209E 03
277	0.1624894E 03	278	0.2566851E 03	279	0.8574498E C2	280	0.5558420E 02
281	0.1091763E 02	282	0.1888406E 03	283	0.1047945E C3	284	-0.3419891E 02
285	-0.4387756E 02	286	0.3158684E 02	287	-0.2264622E C2	288	0.9558555E 01
289	-0.1215344E 02	290	0.1818713E 03	291	0.3621228E C2	292	-0.6417610E 01
293	-0.1820562E 03	294	0.1767654E 02	295	-0.4565625E C2	296	0.9206038E 02
297	0.7663921E 02	298	0.5540114E 02	299	0.1012850E C3	300	0.1678558E 03
301	0.2952910E 03	302	0.3058000E 03	303	0.2488401E C3	304	0.3048184E 03
305	0.3102004E 03	306	0.2900513E 03	307	0.1529596E C3	308	0.1256560E 03
309	0.1092637E 03	310	0.1266132E 03	311	0.5975359E C2	312	0.8789172E 02
313	0.8726509E 02	314	0.8510837E 02	315	0.6549022E 02	316	0.8858426E 02
317	0.1144890E 03	318	0.1342585E 03	319	0.1431260E C3	320	0.1505129E 03
321	0.1614961E 03	322	0.1936486E 03	323	0.1594723E C3	324	0.1548825E 03
325	0.1246828E 03	326	0.9031802E 02	327	0.8795459E C2	328	0.5406964E 02
329	0.6603320E 02	330	0.4297398E 02	331	0.4891904E C2	332	0.4150202E 02
333	0.3948573E 02	334	0.2148700E 02	335	0.2672771E C2	336	0.3930547E 02
337	0.3982953E 02	338	0.3720917E 02	339	0.2777586E C2	340	0.3249252E 02
341	0.3196844E 02	342	0.2725177E 02	343	0.1886662E C2	344	0.1572220E 02
345	0.3196844E 02	346	0.3039622E 02	347	0.2358327E C2	348	0.2096292E 01
349	0.0	350	0.0	351	0.0	352	0.0
353	0.0	354	0.0	355	0.0	356	0.0
357	0.0	358	0.0	359	0.0	360	0.0

TABLE A-5
ALGORITHM FOR ESTIMATING FIRST COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING MAGNETIC INDEX (AA)

$$\text{COEFFICIENT-1} = -128.37 + \left(\sum_I \text{SALG}(I) * \text{AA}(I) \right) / \sqrt{\sum_I \text{AA}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	-0.1668820E 03	2	-0.5816658E 02	3	-0.2063542E 03	4	-0.1093916E 03
5	-0.8750865E 02	6	0.5727635E 02	7	-0.2040027E 03	8	-0.7181322E 02
9	-0.1681926E 03	10	-0.3333103E 03	11	-0.1903076E 02	12	0.7534926E 02
13	0.2694907E 03	14	0.2256252E 03	15	0.1773091E 03	16	0.4115482E 02
17	0.1759464E 03	18	0.3756541E 03	19	0.1257465E 02	20	0.6428384E 02
21	-0.2554922E 03	22	-0.5415938E 03	23	0.2759841E 03	24	0.2735215E 03
25	0.2587732E 02	26	-0.1067909E 03	27	0.9531807E 02	28	-0.2501064E 03
29	0.2097471E 03	30	0.2470475E 03	31	0.2663938E 03	32	0.6603073E 02
33	0.1765921E 03	34	-0.1876511E 03	35	0.1285847E 03	36	0.142102E 03
37	-0.2565533E 02	38	0.7807311E 01	39	-0.1789592E 03	40	-0.3536172E 03
41	-0.1223085E 03	42	0.2611499E 03	43	0.1961259E 03	44	0.1300891E 03
45	0.1011428E 03	46	-0.8839792E 01	47	0.3839600E 03	48	-0.3816998E 01
49	0.1158842E 03	50	0.1081610E 03	51	0.8955819E 01	52	0.1874261E 03
53	-0.2072129E 03	54	-0.3910529E 02	55	0.4079857E 02	56	-0.6342004E 02
57	0.1459053E 03	58	-0.4795125E 02	59	0.2439407E 03	60	0.2076480E 03
61	0.1648466E 03	62	0.3506670E 03	63	0.1970344E 03	64	0.3686611E 03
65	-0.1825648E 03	66	0.4417090E 02	67	0.4097544E 03	68	0.3326733E 03
69	0.1015916E 03	70	0.4961995E 03	71	0.1524071E 03	72	0.3287747E 03
73	0.7398209E 02	74	0.1063649E 03	75	-0.1164337E 03	76	0.1169737E 03
77	-0.1027289E 03	78	-0.6640341E 02	79	0.1558505E 02	80	0.3629692E 02
81	-0.2300215E 03	82	0.4085782E 01	83	-0.2826279E 03	84	-0.6238208E 02
85	-0.2052019E 02	86	-0.1630532E 03	87	-0.2893855E 03	88	-0.4686145E 03
89	-0.2632688E 03	90	-0.2264369E 03	91	-0.1888665E 03	92	-0.3052859E 03
93	-0.3694651E 03	94	-0.4968604E 03	95	-0.3227151E 03	96	0.1154379E 03
97	-0.1412274E 03	98	-0.2961372E 02	99	0.9172424E 02	100	-0.2393082E 03
101	-0.7426582E 02	102	0.1681588E 03	103	-0.4871686E 02	104	-0.5427737E 02
105	0.4899562E 02	106	-0.3943134E 02	107	0.1655235E 03	108	0.6115057E 02
109	0.7926038E 02	110	0.2180862E 02	111	-0.9007730E 02	112	-0.2047352E 03
113	-0.8042001E 02	114	-0.1143740E 03	115	-0.4747188E 02	116	-0.1325620E 03
117	-0.3057983E 03	118	-0.3335361E 03	119	-0.3425249E 03	120	-0.4185715E 02
121	-0.7525624E 02	122	0.1669058E 03	123	0.1421301E 03	124	0.1794972E 03
125	0.2116649E 03	126	0.1191549E 03	127	0.1773875E 03	128	0.2764124E 03
129	0.2384864E 03	130	0.2968074E 03	131	0.1020694E 03	132	0.1040777E 03
133	0.6898183E 02	134	0.4495983E 01	135	-0.5802594E 02	136	-0.2488857E 02
137	-0.3187784E 02	138	-0.5377039E 02	139	0.8003937E 02	140	0.8060980E 02
141	0.9634981E 02	142	0.9066057E 02	143	0.1120934E 03	144	0.8895277E 02
145	0.1238482E 03	146	0.7928294E 02	147	0.9217064E 02	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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TABLE A-6
ALGORITHM FOR ESTIMATING SECOND COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER {SN}

$$\text{COEFFICIENT-2} = 230.70 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.1358737E 02	2	0.4896272E 01	3	0.7710166E C1	4	-0.2134235E 02
5	-0.8210046E 01	6	-0.7499847E 00	7	0.4488803E 02	8	0.8331541E 02
9	0.8997659E 02	10	0.8625894E 02	11	0.3425232E C2	12	-0.3112411E 01
13	-0.3710825E 02	14	-0.4917633E 02	15	-0.4859506E C2	16	-0.3576425E 02
17	0.2163531E 02	18	-0.1216500E 02	19	-0.6410684E C2	20	-0.1144790E 03
21	-0.7656488E 02	22	-0.1192603E 02	23	-0.1783873E C2	24	-0.3830107E 02
25	-0.3877655E 02	26	0.7965912E 01	27	0.5166107E C2	28	-0.2386934E 02
29	-0.1139558E 03	30	-0.1710902E 03	31	-0.1034691E C3	32	-0.4547417E 02
33	0.7445387E 02	34	0.1259167E 03	35	0.1148347E C3	36	0.7019899E 02
37	0.5441293E 01	38	-0.1210046E 02	39	-0.8784027E C0	40	-0.4535153E 02
41	-0.9535004E 01	42	0.3638443E 02	43	0.1383652E C3	44	0.1368228E 03
45	0.2691386E 02	46	-0.1469388E 02	47	0.1767566E C2	48	0.1604869E 03
49	0.2746160E 03	50	0.2047070E 03	51	0.1316997E C3	52	-0.5490137E 02
53	-0.7774321E 02	54	-0.9823863E 02	55	-0.4521399E 02	56	-0.3587463E 02
57	-0.7126247E 02	58	-0.1292867E 03	59	-0.1275301E C3	60	-0.1879493E 03
61	-0.1297335E 03	62	-0.1559053E 03	63	-0.1178252E C3	64	-0.1142227E 03
65	0.1886411E 02	66	0.3162250E 02	67	-0.4675383E 02	68	-0.1949711E 03
69	-0.1879107E 03	70	-0.1082099E 03	71	-0.6294556E C0	72	-0.8624670E 02
73	-0.1862730E 03	74	-0.2809365E 03	75	-0.2370267E C3	76	-0.2292198E 03
77	-0.1821137E 03	78	-0.1844557E 03	79	-0.1338946E C3	80	-0.6584311E 02
81	0.5321719E 02	82	0.1629432E 03	83	0.1707930E C3	84	0.1494081E 03
85	0.1619427E 02	86	-0.3192584E 02	87	-0.7377293E 02	88	0.3066711E 01
89	0.6362476E 02	90	0.1100196E 03	91	0.1476285E C3	92	0.1508202E 03
93	0.1665997E 03	94	0.1514110E 03	95	0.1511746E C3	96	0.1189475E 03
97	0.1302390E 03	98	0.7782680E 02	99	0.1133782E C3	100	0.7398856E 02
101	0.6342783E 02	102	-0.1062199E 02	103	-0.1617244E C2	104	-0.2672327E 02
105	-0.5147385E 01	106	-0.8097733E 01	107	-0.2672662E C2	108	-0.5612491E 02
109	-0.2945450E 02	110	-0.3224600E 02	111	-0.6858797E C2	112	-0.1220883E 03
113	-0.9638881E 02	114	-0.8786757E 02	115	-0.5254648E C2	116	-0.6202242E 02
117	-0.7773875E 02	118	-0.8929422E 02	119	-0.7747397E C2	120	-0.5449199E 02
121	-0.5547055E 02	122	-0.6874272E 02	123	-0.6765364E C2	124	-0.7305646E 02
125	-0.7249136E 02	126	-0.7188715E 02	127	-0.5876285E C2	128	-0.4012451E 02
129	0.5517242E 01	130	-0.3673602E 02	131	-0.3896796E C2	132	-0.6273415E 02
133	-0.4444937E 02	134	-0.5730167E 02	135	-0.2441837E C2	136	-0.5333099E 01
137	0.1497841E 02	138	0.2085080E 02	139	0.2472977E C1	140	-0.1446269E 02
141	-0.2021649E 02	142	-0.9524829E 01	143	-0.2182129E C1	144	-0.9338104E 01
145	-0.1963882E 01	146	0.1857728E 01	147	0.1019315E C2	148	0.7163353E 01
149	0.9195760E 01	150	0.5984540E 01	151	0.6079712E C1	152	0.5057961E 01
153	0.4766028E 01	154	0.2992271E 01	155	0.3722095E C1	156	0.5473665E 01
157	0.5546647E 01	158	0.5181736E 01	159	0.3868059E C1	160	0.4524895E 01
161	0.4451915E 01	162	0.3795077E 01	163	0.2627362E C1	164	0.2189467E 01
165	0.4451915E 01	166	0.4232968E 01	167	0.3284201E C1	168	0.2919289E 00
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	0.1147461E 02	182	0.1326015E 02	183	0.4094272E C2	184	0.1528119E 02
185	0.2315262E 01	186	-0.4188374E 02	187	-0.4737773E C2	188	-0.7312839E 02
189	-0.1064588E 03	190	-0.9135327E 02	191	-0.1235326E C3	192	-0.1843275E 02
193	-0.1550723E 02	194	-0.1756133E 02	195	-0.1159722E C3	196	-0.2055822E 03
197	-0.9946722E 02	198	-0.6962193E 02	199	-0.9026981E C1	200	-0.3819357E 02

TABLE A-6 (CONT.)
ALGORITHM FOR ESTIMATING SECOND COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-2} = 230.70 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	0.3716516E 02	202	0.2729497E 02	203	-0.3122321E 02	204	0.1087923E 02
205	0.6244913E 02	206	0.9130798E 02	207	0.1039026E 02	208	-0.2100343E 02
209	-0.1391983E 03	210	-0.7900117E 02	211	-0.1614954E 02	212	0.2999727E 03
213	0.3459900E 03	214	0.4194661E 03	215	0.3023442E 03	216	0.2252666E 03
217	0.7096674E 02	218	-0.2754474E 02	219	-0.1027696E 03	220	-0.1192350E 03
221	-0.2638889E 03	222	-0.2183354E 03	223	-0.3098584E 03	224	-0.7702159E 02
225	-0.8363885E 02	226	0.2068562E 02	227	0.2089243E 01	228	0.7491502E 02
229	0.1838956E 03	230	0.3597433E 02	231	-0.8188458E 02	232	-0.2405470E 03
233	-0.2639802E 03	234	-0.1616146E 03	235	-0.4112305E 02	236	0.7704689E 02
237	0.3726666E 02	238	0.2554245E 02	239	-0.5152711E 02	240	-0.1300388E 03
241	-0.2337294E 03	242	-0.2642971E 03	243	-0.2473370E 03	244	0.1347929E 02
245	0.1620316E 03	246	0.2300483E 03	247	0.9612619E 02	248	0.1166432E 03
249	0.5141093E 02	250	0.1589230E 03	251	0.1183124E 02	252	-0.1334462E 02
253	-0.1329144E 03	254	-0.7728355E 02	255	-0.1017205E 03	256	-0.1479111E 03
257	-0.1148411E 03	258	0.8223560E 02	259	0.7008905E 02	260	0.1221245E 02
261	0.2799459E 01	262	-0.1512123E 03	263	-0.1534768E 03	264	-0.4316586E 02
265	0.8363196E 02	266	0.1430760E 03	267	0.1272452E 03	268	0.4360555E 02
269	-0.5245926E 01	270	-0.1584068E 03	271	-0.2241741E 03	272	-0.1762798E 03
273	-0.7906647E 02	274	-0.3738618E 02	275	-0.1121088E 03	276	-0.1014036E 03
277	-0.1295313E 02	278	0.4470889E 02	279	0.2779123E 02	280	0.2473952E 02
281	0.2128418E 01	282	0.3346458E 02	283	0.1874780E 02	284	0.2031653E 02
285	-0.3938904E 01	286	-0.4190475E 02	287	0.7059692E 01	288	0.2201379E 02
289	0.5778604E 02	290	0.7264124E 02	291	0.1215300E 03	292	0.1478133E 03
293	0.1370004E 03	294	0.1389394E 03	295	0.5429163E 02	296	0.4075401E 02
297	0.2881613E 02	298	0.5555638E 02	299	0.6374551E 02	300	0.6975377E 02
301	0.5458992E 02	302	0.1156282E 02	303	-0.2092477E 02	304	-0.2842027E 02
305	0.2476466E 02	306	0.3924332E 02	307	0.3813020E 02	308	0.1986983E 02
309	0.5952987E 01	310	0.2522830E 02	311	0.7960641E 01	312	0.1073647E 02
313	0.2482967E 02	314	0.4155568E 02	315	0.4383621E 02	316	0.3749852E 02
317	0.2014682E 02	318	0.2645857E 02	319	0.3508517E 02	320	0.4300134E 02
321	0.3672122E 02	322	0.2234775E 02	323	0.2459900E 02	324	0.1856812E 01
325	0.3561890E 01	326	-0.1782285E 02	327	0.5585217E 01	328	0.9434237E 01
329	0.1106678E 02	330	0.7202192E 01	331	0.8943503E 01	332	0.77113862E 01
333	0.7362539E 01	334	0.3601097E 01	335	0.4479414E 01	336	0.6587374E 01
337	0.6675202E 01	338	0.6236045E 01	339	0.4655077E 01	340	0.5445563E 01
341	0.5357730E 01	342	0.4567243E 01	343	0.3161939E 01	344	0.2634949E 01
345	0.5357730E 01	346	0.5094234E 01	347	0.3952424E 01	348	0.3513266E 00
349	0.0	350	0.0	351	0.0	352	0.0
353	0.0	354	0.0	355	0.0	356	0.0
357	0.0	358	0.0	359	0.0	360	0.0

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TABLE A-7
ALGORITHM FOR ESTIMATING SECOND COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING MODERN SUNSPOT NUMBER (SM)

$$\text{COEFFICIENT-2} = -153.18 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

I	SALG(I)		I	SALG(I)		I	SALG(I)		I	SALG(I)	
1	0.2124173E	01	2	-0.1395067E	02	3	-0.1182542E	02	4	-0.2359541E	02
5	-0.2002290E	02	6	-0.4207269E	02	7	-0.1441678E	02	8	-0.1031769E	02
9	-0.2401875E	02	10	-0.5002925E	02	11	-0.6025757E	02	12	-0.4603763E	02
13	-0.3054822E	02	14	-0.2160065E	02	15	-0.5665924E	02	16	-0.8431561E	02
17	-0.5137112E	02	18	-0.1889569E	02	19	-0.1132894E	03	20	-0.1973685E	03
21	-0.1296479E	03	22	-0.1071064E	02	23	0.4539453E	02	24	-0.8011724E	01
25	-0.1476977E	02	26	0.9242938E	02	27	0.2077232E	03	28	0.1888547E	03
29	0.5126656E	02	30	0.5426213E	02	31	0.1252523E	03	32	0.1788244E	03
33	0.1127283E	03	34	0.1231243E	03	35	0.1901636E	03	36	0.2798704E	03
37	0.2799451E	03	38	0.8353723E	02	39	-0.6875310E	02	40	-0.9350433E	02
41	0.1134461E	03	42	0.1054541E	03	43	0.1368527E	02	44	-0.1227572E	03
45	-0.2262166E	03	46	-0.2124676E	03	47	-0.9592627E	02	48	0.1765913E	03
49	0.2973164E	03	50	0.1705962E	03	51	0.1203685E	03	52	0.5375142E	02
53	0.1426162E	03	54	0.2809538E	02	55	0.7620541E	02	56	0.3692772E	02
57	0.6780824E	02	58	0.4440089E	02	59	0.6200201E	02	60	0.3310622E	02
61	-0.3187068E	02	62	-0.9023926E	01	63	0.6126198E	02	64	0.8644925E	02
65	0.2578789E	02	66	-0.2382541E	02	67	-0.2472894E	02	68	-0.4795337E	02
69	-0.7799870E	02	70	-0.1636007E	03	71	-0.1215707E	03	72	-0.9958101E	02
73	-0.3775703E	02	74	-0.6769498E	02	75	-0.1263647E	03	76	-0.2122652E	03
77	-0.2136713E	03	78	-0.2003950E	03	79	-0.1622934E	03	80	-0.1748861E	03
81	-0.1679831E	03	82	-0.1333906E	03	83	-0.5818027E	02	84	0.9869720E	01
85	0.4931917E	02	86	-0.1462194E	02	87	-0.3800183E	02	88	-0.3097254E	01
89	-0.2489573E	01	90	-0.5645802E	02	91	-0.1828226E	03	92	-0.1473860E	03
93	-0.1094205E	03	94	-0.4386250E	02	95	-0.2138318E	02	96	0.7760159E	01
97	0.7388495E	02	98	0.7105865E	02	99	0.7047099E	02	100	0.1754204E	02
101	-0.5023477E	02	102	-0.4983124E	02	103	0.9857829E	01	104	0.1042576E	03
105	0.8473279E	02	106	0.2628438E	02	107	-0.1568060E	02	108	-0.1766985E	02
109	0.7556544E	01	110	-0.2555046E	02	111	0.2261647E	02	112	0.3409100E	02
113	0.7770296E	02	114	0.2773126E	02	115	-0.5600894E	01	116	-0.3079260E	02
117	-0.4514497E	02	118	-0.4034492E	02	119	-0.3276979E	02	120	-0.5041832E	02
121	-0.6350006E	02	122	-0.7780385E	02	123	-0.4821237E	02	124	-0.7234509E	02
125	-0.9611975E	02	126	-0.1057943E	03	127	-0.8452487E	02	128	-0.7860355E	02
129	-0.5809155E	02	130	-0.7030258E	02	131	-0.5721767E	02	132	-0.4786128E	02
133	-0.3309853E	02	134	-0.3128625E	02	135	-0.1550436E	02	136	-0.1347211E	02
137	-0.1477220E	02	138	-0.1658716E	02	139	-0.6501575E	01	140	-0.3291134E	01
141	-0.4913924E	01	142	-0.9952771E	01	143	-0.5209330E	01	144	0.1732079E	01
145	0.3760895E	01	146	0.6275106E	01	147	0.2313802E	01	148	0.0	
149	0.0		150	0.0		151	0.0		152	0.0	
153	0.0		154	0.0		155	0.0		156	0.0	
157	0.0		158	0.0		159	0.0		160	0.0	
161	0.0		162	0.0		163	0.0		164	0.0	
165	0.0		166	0.0		167	0.0		168	0.0	
169	0.0		170	0.0		171	0.0		172	0.0	
173	0.0		174	0.0		175	0.0		176	0.0	
177	0.0		178	0.0		179	0.0		180	0.0	
181	0.3125541E	01	182	-0.1570371E	00	183	0.1249183E	02	184	0.1015017E	02
185	0.2268376E	02	186	-0.9079772E	01	187	-0.1503928E	02	188	-0.1051568E	02
189	0.3353131E	02	190	0.3263074E	02	191	-0.3871625E	02	192	-0.6899767E	02
193	-0.7258716E	02	194	-0.4636348E	02	195	-0.6242203E	02	196	-0.1101584E	03
197	-0.4558255E	02	198	-0.2086502E	02	199	0.5511347E	01	200	-0.9942883E	01

TABLE A-7 (CONT.)
ALGORITHM FOR ESTIMATING SECOND COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING MODERN SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-2} = -153.18 + \left\{ \sum_I \text{SALG}(I) * \text{SN}(I) \right\} / \sqrt{\sum_I \text{SN}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)	
201	0.6884746E	02	202	0.1620455E	03	203	0.1520714E	03
205	0.2432021E	02	206	-0.4059518E	02	207	-0.5015163E	02
209	0.5084142E	02	210	0.1405821E	03	211	0.2329845E	03
213	0.1802601E	03	214	0.7492978E	02	215	0.5293575E	02
217	0.1764381E	02	218	-0.4984866E	02	219	-0.7275703E	02
221	0.2155965E	03	222	0.3720022E	03	223	0.3379773E	03
225	0.5518570E	02	226	-0.1430470E	02	227	-0.2498947E	02
229	0.5487332E	02	230	0.1368843E	02	231	-0.8095992E	02
233	-0.8261382E	02	234	-0.3202975E	02	235	0.4033221E	02
237	0.2558113E	02	238	0.2209706E	02	239	-0.5238817E	02
241	-0.1071981E	03	242	-0.1256821E	03	243	-0.6976529E	02
245	0.1932246E	02	246	-0.5299521E	02	247	-0.1631495E	03
249	-0.3715785E	02	250	0.2615218E	02	251	0.3161687E	01
253	-0.5902754E	02	254	-0.6000633E	02	255	0.1925056E	02
257	-0.1835049E	02	258	-0.7199632E	02	259	-0.7377411E	02
261	-0.1487617E	03	262	-0.2086417E	03	263	-0.1658142E	03
265	-0.1028617E	03	266	-0.9628128E	02	267	-0.4576633E	02
269	-0.6742265E	01	270	-0.4741789E	02	271	-0.4081190E	02
273	0.3778151E	02	274	0.3352640E	02	275	0.2141139E	02
277	0.1322771E	02	278	-0.1889890E	02	279	-0.8736099E	02
281	-0.6241551E	02	282	-0.4549231E	02	283	-0.1101143E	03
285	-0.3779294E	02	286	-0.7483281E	02	287	-0.5173813E	02
289	0.8113992E	02	290	0.7879750E	02	291	0.4540628E	02
293	0.5749146E	02	294	0.7971022E	02	295	0.4469478E	02
297	0.1319935E	02	298	0.4018317E	02	299	0.3461279E	02
301	0.3615567E	01	302	-0.1325693E	02	303	-0.6193071E	01
305	-0.5229240E	02	306	-0.9074269E	02	307	-0.8822481E	02
309	-0.2679636E	02	310	-0.1320073E	02	311	0.7392431E	01
313	0.2352516E	02	314	0.5509553E	01	315	0.2156660E	01
317	0.9775914E	01	318	0.7482010E	01	319	0.1261334E	02
321	0.2126962E	02	322	0.1244357E	02	323	0.7967972E	01
325	-0.1719664E	02	326	-0.2125925E	02	327	-0.5787113E	01
329	0.0		330	0.0		331	0.0	
333	0.0		334	0.0		335	0.0	
337	0.0		338	0.0		339	0.0	
341	0.0		342	0.0		343	0.0	
345	0.0		346	0.0		347	0.0	
349	0.0		350	0.0		351	0.0	
353	0.0		354	0.0		355	0.0	
357	0.0		358	0.0		359	0.0	
						204	0.1201098E	03
						208	0.2445274E	02
						212	0.3260332E	03
						216	0.5140384E	02
						220	0.8145593E	02
						224	0.2445536E	03
						228	0.8877800E	02
						232	-0.1277417E	03
						236	0.5982733E	02
						240	-0.4098419E	02
						244	0.2050902E	02
						248	-0.4261179E	02
						252	-0.2131076E	02
						256	0.4849008E	02
						260	-0.8161230E	02
						264	-0.9568222E	02
						268	0.2629469E	02
						272	-0.1117095E	02
						276	-0.3953459E	01
						280	-0.7231099E	02
						284	-0.8890175E	02
						288	-0.2406956E	02
						292	0.2694035E	02
						296	0.2752942E	02
						300	0.3003900E	02
						304	-0.1131475E	02
						308	-0.7125658E	02
						312	0.1872009E	02
						316	-0.2667743E	01
						320	0.1561475E	02
						324	-0.2547687E	02
						328	0.0	
						332	0.0	
						336	0.0	
						340	0.0	
						344	0.0	
						348	0.0	
						352	0.0	
						356	0.0	
						360	0.0	

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TABLE A-8
ALGORITHM FOR ESTIMATING THIRD COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-3} = 264.38 + \left(\sum_I \text{SALG}(I) \cdot \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.3726059E	01	2 -0.2007218E	01	3 0.7422887E	01	4 0.6440621E
5	0.2910680E	02	6 0.1884904E	02	7 0.3199815E	02	8 0.2832198E
9	0.4464700E	02	10 0.3576244E	02	11 0.7652528E	01	12 0.2398816E
13	0.4026262E	02	14 0.2811722E	02	15 -0.2545105E	02	16 -0.8220793E
17	-0.5535150E	02	18 -0.6115114E	02	19 -0.5393040E	02	20 -0.6367400E
21	-0.1227958E	02	22 0.2257912E	02	23 0.2953284E	02	24 0.3881575E
25	0.4173095E	01	26 -0.3832184E	02	27 -0.6753825E	02	28 -0.9376040E
29	0.8202643E	01	30 0.5208005E	02	31 -0.4193504E	01	32 0.4756304E
33	0.1516677E	02	34 0.6526878E	02	35 0.1057544E	03	36 0.1059333E
37	0.7727129E	02	38 0.3422136E	02	39 0.7070326E	02	40 0.1527430E
41	0.2450687E	02	42 -0.3734021E	02	43 -0.1176390E	03	44 -0.2847073E
45	-0.8944536E	02	46 -0.1339317E	03	47 -0.1890181E	03	48 -0.1096722E
49	-0.9049886E	02	50 -0.1012382E	03	51 -0.1169407E	03	52 -0.9906033E
53	-0.4812152E	02	54 -0.8824463E	02	55 -0.9305055E	02	56 -0.1128749E
57	-0.1401185E	03	58 -0.7305270E	02	59 -0.4822565E	02	60 -0.7274861E
61	-0.1283283E	03	62 -0.1136831E	03	63 -0.1118295E	03	64 -0.9971642E
65	0.3765169E	01	66 0.8684488E	02	67 0.5143216E	02	68 0.5843611E
69	0.6373633E	02	70 0.1138797E	03	71 0.6959909E	02	72 0.5752538E
73	0.7327293E	02	74 0.1544555E	03	75 0.1265427E	03	76 0.6334467E
77	0.6549544E	02	78 0.4845784E	02	79 0.8575639E	02	80 0.9620830E
81	-0.3102402E	02	82 -0.1063710E	03	83 -0.1176600E	03	84 -0.9940662E
85	-0.6076439E	02	86 -0.3681630E	02	87 0.2208058E	02	88 0.3382979E
89	0.4304982E	02	90 -0.1061218E	02	91 0.1417717E	02	92 0.6933194E
93	0.7285686E	02	94 0.5182831E	02	95 -0.3426068E	02	96 -0.6692592E
97	-0.8202179E	02	98 -0.4717632E	02	99 -0.4936177E	02	100 -0.2520863E
101	-0.8056049E	02	102 -0.5557788E	02	103 -0.1109678E	03	104 -0.6429681E
105	-0.2245641E	02	106 -0.7704473E	00	107 0.1320475E	02	108 -0.2093391E
109	-0.2254680E	02	110 -0.1979431E	02	111 -0.4575542E	02	112 -0.2301768E
113	-0.3766432E	02	114 0.4941784E	01	115 -0.2463530E	02	116 -0.1184388E
117	-0.1833168E	02	118 -0.9803530E	01	119 -0.1752943E	02	120 -0.1439187E
121	-0.1660429E	02	122 -0.1532714E	02	123 -0.2016360E	02	124 0.9010364E
125	0.2722163E	02	126 0.2394043E	02	127 -0.5341293E	01	128 -0.1951222E
129	-0.2106630E	02	130 0.3438713E	02	131 0.2797362E	02	132 0.4383807E
133	0.2370325E	02	134 0.1235271E	02	135 -0.1111182E	02	136 -0.2061211E
137	-0.5564601E	01	138 0.7517315E	01	139 0.1670911E	02	140 0.2135622E
141	0.2689670E	02	142 0.2350285E	02	143 0.2617281E	02	144 0.3743624E
145	0.8027214E	01	146 -0.9972904E	01	147 0.1156860E	02	148 0.1239925E
149	0.1492099E	02	150 0.9710502E	01	151 0.1141696E	02	152 0.9759071E
153	0.9285389E	01	154 0.4855247E	01	155 0.6039455E	01	156 0.8881554E
157	0.8999975E	01	158 0.8407872E	01	159 0.6276296E	01	160 0.7342085E
161	0.7223664E	01	162 0.6157875E	01	163 0.4263145E	01	164 0.3552621E
165	0.7223664E	01	166 0.6868400E	01	167 0.5328928E	01	168 0.4736828E
169	0.0		170 0.0		171 0.0		172 0.0
173	0.0		174 0.0		175 0.0		176 0.0
177	0.0		178 0.0		179 0.0		180 0.0
181	0.6777399E	01	182 0.6927949E	01	183 0.1276807E	02	184 0.1262124E
185	0.2179605E	02	186 0.2461646E	02	187 0.5537169E	02	188 0.8675798E
189	0.9733014E	02	190 0.7492043E	02	191 0.1047053E	02	192 -0.2998314E
193	-0.4277719E	02	194 -0.3728262E	02	195 -0.3793336E	02	196 0.1478007E
197	-0.7976023E	01	198 -0.3773347E	02	199 -0.1035039E	03	200 -0.4278369E

TABLE A-8 (CONT.)
ALGORITHM FOR ESTIMATING THIRD COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-3} = 264.38 + \left(\sum_I \text{SALG}(I) \cdot \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)		I	SALG(I)		I	SALG(I)		I	SALG(I)	
201	-0.1196450E	02	202	0.1232232E	02	203	-0.2052733E	02	204	-0.2172609E	02
205	-0.3055829E	02	206	-0.5366747E	02	207	-0.2525349E	02	208	0.3821207E	02
209	0.1258127E	03	210	0.1129530E	03	211	0.3022116E	02	212	-0.8594638E	02
213	-0.8526717E	02	214	-0.7841113E	02	215	-0.4278933E	01	216	0.3264561E	02
217	0.1000152E	03	218	0.9534457E	02	219	0.8739784E	02	220	-0.3829671E	00
221	-0.6558942E	02	222	-0.1616810E	03	223	-0.7988403E	02	224	-0.2799521E	02
225	0.3663751E	02	226	-0.6916273E	02	227	-0.9457680E	02	228	-0.9824432E	02
229	-0.5541893E	02	230	-0.1128346E	03	231	-0.1393841E	03	232	-0.8780385E	02
233	0.7688036E	02	234	0.8730688E	02	235	0.5551244E	01	236	-0.1234729E	03
237	-0.2225419E	03	238	-0.1525261E	03	239	-0.6593155E	02	240	0.9767752E	02
241	0.1580811E	03	242	0.1364515E	03	243	0.8137141E	02	244	-0.1096613E	03
245	-0.1631247E	03	246	-0.1778644E	03	247	-0.9504689E	02	248	-0.1100536E	03
249	-0.3141861E	02	250	0.4303521E	01	251	0.4094020E	02	252	-0.5858581E	00
253	-0.7832912E	02	254	-0.7499448E	02	255	-0.1180779E	03	256	-0.1137913E	03
257	-0.6235066E	02	258	-0.3344609E	02	259	0.3487349E	01	260	-0.6486447E	02
261	-0.4609628E	02	262	-0.7874786E	02	263	-0.3297687E	02	264	-0.6523074E	02
265	-0.3853214E	02	266	-0.8168529E	02	267	-0.4405753E	02	268	-0.2698392E	02
269	-0.8989171E	01	270	-0.4822981E	02	271	-0.3036899E	02	272	0.6721249E	01
273	0.3527478E	02	274	0.6146576E	02	275	0.8263744E	02	276	0.7070673E	02
277	0.3956494E	02	278	-0.2778084E	02	279	0.3990302E	01	280	0.2990838E	01
281	-0.8150005E	01	282	-0.3077843E	02	283	-0.5921664E	02	284	-0.1117917E	02
285	0.3258296E	01	286	0.4361467E	02	287	0.1149958E	02	288	-0.2176353E	02
289	-0.1353653E	02	290	-0.9065218E	01	291	-0.4176619E	02	292	-0.5539659E	02
293	-0.3975418E	02	294	-0.3090344E	02	295	-0.6252289E	01	296	-0.5810071E	01
297	0.7378669E	01	298	-0.4539272E	01	299	-0.1200751E	02	300	-0.2354840E	02
301	-0.2326363E	02	302	-0.1997795E	02	303	-0.1436790E	02	304	-0.2755440E	02
305	-0.3508592E	02	306	-0.3009164E	02	307	-0.1750027E	02	308	-0.1051046E	02
309	-0.7021373E	01	310	-0.2928891E	01	311	0.3704569E	01	312	0.4131037E	01
313	-0.1417608E	01	314	-0.5252915E	01	315	-0.6433749E	01	316	-0.2501856E	01
317	0.3128918E	01	318	0.7911117E	01	319	0.5914710E	01	320	0.2759414E	01
321	-0.1290745E	01	322	-0.9992934E	00	323	0.1701927E	01	324	0.4999835E	00
325	0.1966228E	01	326	0.1222960E	01	327	0.4123882E	01	328	0.2918996E	01
329	0.3624912E	01	330	0.2359066E	01	331	0.2587078E	01	332	0.2184311E	01
333	0.2069236E	01	334	0.1179534E	01	335	0.1467226E	01	336	0.2157684E	01
337	0.2186452E	01	338	0.2042606E	01	339	0.1524764E	01	340	0.1783686E	01
341	0.1754916E	01	342	0.1495994E	01	343	0.1035689E	01	344	0.8630729E	00
345	0.1754916E	01	346	0.1668610E	01	347	0.1294611E	01	348	0.1150765E	00
349	0.0		350	0.0		351	0.0		352	0.0	
353	0.0		354	0.0		355	0.0		356	0.0	
357	0.0		358	0.0		359	0.0		360	0.0	

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TABLE A-9
ALGORITHM FOR ESTIMATING THIRD COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING MODERN SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-3} = -0.836 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

a-18	I		SALG(I)		I		SALG(I)		I		SALG(I)		I		SALG(I)	
	1	-0.3487109E	01		2	-0.2658453E	01		3	0.8347191E	01		4	0.4340255E	01	
	5	0.3909404E	01		6	-0.1291054E	02		7	-0.8600302E	01		8	-0.5925991E	01	
	9	0.9672330E	01		10	0.7267823E	01		11	-0.1769182E	00		12	0.1457518E	01	
	13	0.1013768E	01		14	-0.6660293E	01		15	-0.3106337E	02		16	-0.5965578E	02	
	17	-0.4181766E	02		18	-0.4440077E	02		19	-0.3288557E	02		20	-0.3881750E	02	
	21	0.2593365E	00		22	0.8401060E	01		23	-0.1063301E	02		24	-0.2225932E	02	
	25	-0.3913330E	02		26	-0.5317711E	02		27	-0.9043475E	02		28	-0.6222556E	02	
	29	-0.5222997E	02		30	-0.1953793E	02		31	-0.1523518E	02		32	0.1517170E	02	
	33	-0.5017457E	01		34	-0.1556535E	02		35	-0.1314597E	02		36	0.1903577E	02	
	37	0.2692557E	02		38	0.4625414E	02		39	0.6691298E	02		40	0.1064056E	03	
	41	0.5817076E	02		42	0.3509351E	02		43	0.1561032E	02		44	0.4110103E	02	
	45	0.1299515E	02		46	-0.1286920E	02		47	-0.3765080E	01		48	0.2192697E	02	
	49	0.2662143E	02		50	-0.5379780E	01		51	-0.2810136E	02		52	-0.4588608E	02	
	53	-0.2950229E	02		54	-0.2739525E	02		55	-0.7987102E	01		56	-0.9166125E	01	
	57	0.1568376E	02		58	0.2799840E	02		59	0.2498105E	02		60	-0.7690206E	00	
	61	-0.2699305E	01		62	-0.1475830E	02		63	-0.1263269E	02		64	0.2691420E	01	
	65	0.2132391E	02		66	0.4213756E	02		67	0.5133251E	01		68	0.2515556E	02	
	69	0.3781612E	01		70	0.5226056E	02		71	0.3415009E	02		72	0.4027216E	02	
	73	0.2763772E	01		74	0.2687590E	02		75	0.3157076E	02		76	0.1182075E	02	
	77	-0.2091142E	02		78	-0.4539555E	02		79	-0.1580407E	02		80	-0.2236626E	02	
	81	-0.1881406E	02		82	-0.5053450E	02		83	-0.2994685E	02		84	0.7918418E	01	
	85	0.4099896E	02		86	0.4469324E	02		87	0.4010789E	02		88	0.3356993E	02	
	89	0.1734641E	02		90	-0.6374652E	01		91	0.2723423E	01		92	0.1016200E	02	
	93	0.1398578E	01		94	-0.3180348E	02		95	-0.5913579E	02		96	-0.7182939E	02	
	97	-0.5683905E	02		98	-0.4709705E	02		99	-0.1909416E	02		100	-0.1626985E	02	
	101	-0.2415991E	02		102	-0.5142644E	02		103	-0.8019519E	02		104	-0.8684087E	02	
	105	-0.7094070E	02		106	-0.6878534E	02		107	-0.4500233E	02		108	-0.4159525E	02	
	109	-0.1781474E	02		110	-0.1091285E	02		111	-0.1920946E	02		112	-0.2396182E	02	
	113	-0.3302365E	02		114	-0.1942126E	02		115	-0.2704652E	02		116	-0.2792212E	02	
	117	-0.2927197E	02		118	-0.1932529E	02		119	-0.2599673E	02		120	-0.2017755E	02	
	121	-0.3034955E	02		122	-0.2962579E	02		123	-0.3423599E	02		124	-0.2094716E	02	
	125	-0.1437669E	02		126	-0.1985904E	02		127	-0.2980476E	02		128	-0.2407239E	02	
	129	-0.1134703E	02		130	0.4936185E	01		131	0.3077931E	01		132	-0.2520066E	01	
	133	-0.4704680E	01		134	-0.1007532E	02		135	-0.1216915E	02		136	-0.1258484E	02	
	137	-0.2759581E	01		138	0.3086172E	01		139	-0.2079187E	01		140	-0.5170362E	01	
	141	-0.4194693E	01		142	-0.3975942E	01		143	-0.2489504E	01		144	-0.1436191E	02	
	145	-0.1063232E	02		146	-0.1373262E	02		147	-0.3957465E	01		148	0.0		
	149	0.0			150	0.0			151	0.0			152	0.0		
	153	0.0			154	0.0			155	0.0			156	0.0		
	157	0.0			158	0.0			159	0.0			160	0.0		
	161	0.0			162	0.0			163	0.0			164	0.0		
	165	0.0			166	0.0			167	0.0			168	0.0		
	169	0.0			170	0.0			171	0.0			172	0.0		
	173	0.0			174	0.0			175	0.0			176	0.0		
	177	0.0			178	0.0			179	0.0			180	0.0		
	181	-0.3386454E	01		182	-0.4725752E	01		183	-0.5944077E	01		184	-0.1450120E	02	
	185	-0.2988908E	02		186	-0.3101378E	02		187	-0.2371486E	02		188	-0.1184379E	02	
	189	-0.1664781E	02		190	-0.2650087E	02		191	-0.3727545E	02		192	-0.2877553E	02	
	193	-0.1935567E	02		194	-0.2560194E	02		195	-0.4351222E	02		196	-0.3777852E	02	
	197	-0.4285179E	02		198	-0.3154051E	02		199	-0.4163289E	02		200	-0.2600226E	02	

TABLE A-9 (CONT.)
 ALGORITHM FOR ESTIMATING THIRD COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING MODERN SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-3} = -0.836 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	-0.1397273E 02	202	-0.2567635E 02	203	-0.3114037E C2	204	-0.3114650E 02
205	-0.1235014E 02	206	0.3986519E 01	207	-0.3329747E C1	208	0.1792409E 02
209	0.2615434E 02	210	0.5577077E 02	211	0.4074925E C2	212	0.2859056E 02
213	-0.3081982E 02	214	-0.4859296E 02	215	-0.3937302E C2	216	0.4123632E 01
217	0.3343567E 02	218	0.2072488E 02	219	-0.1599738E C1	220	-0.1655814E 02
221	-0.1742493E 02	222	-0.4742186E 02	223	-0.3589590E C2	224	-0.7353745E 01
225	0.7374207E 02	226	0.5462677E 02	227	0.3586804E C2	228	-0.6972281E 01
229	-0.1941350E 02	230	-0.5457594E 02	231	-0.5044707E C2	232	-0.2473019E 02
233	0.5219701E 02	234	0.6363217E 02	235	0.4995590E 02	236	0.2560504E 02
237	-0.2015532E 02	238	-0.5116245E 01	239	-0.5268454E C1	240	0.6428365E 02
241	0.8455374E 02	242	0.8137895E 02	243	0.6179900E 02	244	-0.8302479E 01
245	-0.4660710E 02	246	-0.7250980E 02	247	-0.2141733E C2	248	0.1027538E 02
249	0.1943338E 02	250	0.6221314E 01	251	-0.1958771E C2	252	-0.3481282E 01
253	-0.4154356E 01	254	0.1910782E 02	255	-0.2059053E C2	256	-0.2750293E 02
257	-0.1196431E 02	258	0.1127600E 02	259	0.1990065E C2	260	-0.2574536E 02
261	-0.4093771E 02	262	-0.7945004E 02	263	-0.5887729E C2	264	-0.6189398E 02
265	-0.4038853E 01	266	-0.4457340E 01	267	0.1877634E C2	268	-0.6988196E 01
269	-0.3623155E 02	270	-0.7955147E 02	271	-0.1027462E C3	272	-0.7581552E 02
273	-0.4944302E 02	274	-0.1473250E 02	275	0.2897107E 01	276	0.1724606E 02
277	0.1789441E 02	278	0.2962622E 01	279	0.5688408E C1	280	-0.1556011E 01
281	-0.1029941E 02	282	0.9425581E-01	283	0.8298241E C1	284	0.2713055E 02
285	0.1643678E 02	286	0.2040331E 02	287	0.8831935E 01	288	0.7899598E 01
289	0.1098014E 02	290	0.1769766E 02	291	0.2570642E C2	292	0.2475984E 02
293	0.3323009E 02	294	0.2720319E 02	295	0.2262032E C2	296	0.1829135E 02
297	0.2578926E 02	298	0.2396187E 02	299	0.1967828E C2	300	0.9704904E 01
301	0.1107666E 02	302	0.1114261E 02	303	0.1118247E C2	304	0.1248861E 01
305	-0.4036760E 01	306	0.4425442E 01	307	0.7488296E 01	308	0.3061606E 01
309	-0.8485461E 01	310	-0.3615864E 01	311	0.2386349E C1	312	0.7721842E 01
313	0.8772902E 01	314	0.5643149E 01	315	0.1239550E C1	316	0.8594927E 00
317	0.1053613E 01	318	-0.4503892E-01	319	0.1687120E C1	320	0.2618546E 01
321	0.3115492E 01	322	0.1865464E 01	323	0.1217396E C1	324	-0.8518640E 00
325	-0.3598135E 00	326	-0.3098381E 00	327	-0.3406048E-01	328	0.0
329	0.0	330	0.0	331	0.0	332	0.0
333	0.0	334	0.0	335	0.0	336	0.0
337	0.0	338	0.0	339	0.0	340	0.0
341	0.0	342	0.0	343	0.0	344	0.0
345	0.0	346	0.0	347	0.0	348	0.0
349	0.0	350	0.0	351	0.0	352	0.0
353	0.0	354	0.0	355	0.0	356	0.0
357	0.0	358	0.0	359	0.0	360	0.0

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TABLE A-10
ALGORITHM FOR ESTIMATING FOURTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-4} = 197.22 + \left\{ \sum_I \text{SALG}(I) * \text{SN}(I) \right\} / \sqrt{\sum_I \text{SN}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	-0.9050838E 01	2	-0.7157135E-01	3	-0.2914336E 01	4	-0.2554585E 01
5	-0.1904231E 02	6	-0.3616043E 02	7	-0.4331047E 02	8	-0.3012204E 02
9	-0.1709454E 02	10	-0.2240131E 02	11	-0.6020695E 01	12	0.1313898E 02
13	0.1107570E 02	14	0.8296172E 01	15	0.7915138E 01	16	0.4590053E 02
17	0.6037898E 02	18	0.2447444E 02	19	-0.1825925E 02	20	-0.3949323E 02
21	-0.7876160E 01	22	0.4711105E 02	23	0.4825471E 02	24	0.3554608E 02
25	0.5719162E 01	26	0.8252821E 01	27	-0.3113443E 02	28	-0.4509081E 02
29	-0.6695865E 02	30	-0.6787868E 02	31	-0.4052299E 02	32	0.2919312E 01
33	-0.1564372E 02	34	-0.1076996E 02	35	-0.6264163E 02	36	-0.7369850E 02
37	-0.1231642E 03	38	-0.6534995E 02	39	0.1181268E 02	40	0.1450298E 02
41	0.2012190E 02	42	0.1171227E 02	43	0.4482837E 02	44	-0.2050999E 02
45	0.2391785E 02	46	0.3707040E 02	47	0.3795711E 02	48	-0.4840742E 02
49	-0.1290178E 03	50	-0.1136301E 03	51	-0.1192723E 03	52	-0.1358740E 03
53	-0.1556105E 03	54	-0.1032421E 03	55	-0.6213887E 02	56	-0.7977109E 02
57	-0.6287584E 02	58	-0.9511284E 02	59	-0.7776498E 02	60	-0.8631787E 02
61	-0.5452484E 01	62	-0.2569255E 02	63	-0.8212199E 02	64	-0.1375818E 03
65	-0.1315321E 03	66	-0.1010782E 03	67	-0.9724837E 02	68	-0.2173271E 02
69	-0.6834532E 02	70	0.6645599E 01	71	0.3482806E 02	72	0.6268376E 02
73	0.2291190E 02	74	-0.2037164E 02	75	-0.1342799E 02	76	-0.5586862E 02
77	-0.1252108E 03	78	-0.1119282E 03	79	-0.4662050E 02	80	0.7590624E 01
81	0.6736420E 01	82	0.4512332E 02	83	0.1214439E 03	84	0.1739772E 03
85	0.1440777E 03	86	0.8558925E 02	87	0.4249121E 02	88	-0.4667862E 01
89	-0.2574432E 02	90	0.1082381E 02	91	0.2396098E 02	92	-0.2928564E 02
93	-0.7473431E 02	94	-0.9401572E 02	95	-0.3918083E 02	96	-0.2846970E 02
97	-0.3108615E 02	98	-0.2188258E 02	99	-0.1134883E 01	100	-0.1589285E 02
101	-0.1997704E 02	102	-0.3315152E 02	103	0.7418607E 01	104	-0.1006142E 02
105	-0.5726569E 01	106	0.2765938E 02	107	0.5996606E 02	108	0.8471318E 02
109	0.3781302E 02	110	0.5379614E 01	111	-0.3582033E 02	112	-0.4637144E 02
113	-0.3871912E 02	114	-0.1368282E 02	115	0.1477538E 02	116	0.1993063E 02
117	0.1550231E 02	118	-0.1050589E 02	119	-0.2220477E 02	120	-0.6063802E 01
121	-0.1398898E 02	122	-0.2805291E 01	123	-0.3019441E 02	124	0.1303853E 01
125	0.3893822E 02	126	0.7447934E 02	127	0.6885025E 02	128	0.5201317E 02
129	0.3338297E 02	130	0.1083141E 02	131	0.8229239E 01	132	-0.1368222E 02
133	-0.9460421E 01	134	-0.1323076E 02	135	-0.1574512E 01	136	0.7273515E 01
137	0.9586782E 01	138	0.1020141E 02	139	0.1524730E 02	140	0.1698387E 02
141	0.2406320E 02	142	0.3339534E 02	143	0.3303899E 02	144	0.3493123E 02
145	0.3192535E 02	146	0.2218861E 02	147	0.2481844E 02	148	0.1572722E 02
149	0.1922417E 02	150	0.1251097E 02	151	0.1421371E 02	152	0.1207769E 02
153	0.1146740E 02	154	0.6255481E 01	155	0.7781210E 01	156	0.1144296E 02
157	0.1159553E 02	158	0.1083267E 02	159	0.8086356E 01	160	0.9459512E 01
161	0.9306938E 01	162	0.7933782E 01	163	0.5492620E 01	164	0.4577183E 01
165	0.9306938E 01	166	0.8849219E 01	167	0.6865772E 01	168	0.6102911E 00
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	-0.8204161E 01	182	-0.1323107E 02	183	-0.1827663E 02	184	-0.3396390E 02
185	-0.5146739E 02	186	-0.2502773E 02	187	-0.1465233E 02	188	-0.3949456E 01
189	-0.2204150E 02	190	-0.3015157E 02	191	-0.6854331E 01	192	0.3506831E 02
193	0.5546953E 02	194	0.2763136E 02	195	0.2190587E 02	196	0.2585933E 02
197	0.5711317E 02	198	0.1072018E 03	199	0.1873951E 03	200	0.1644635E 03

TABLE A-10 (CONT.)
ALGORITHM FOR ESTIMATING FOURTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-4} = 197.22 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	0.8632932E	02	202	-0.7756058E	01	203	-0.5439224E
205	0.7639865E	02	206	0.1024641E	03	207	0.2397415E
209	-0.1112427E	03	210	-0.7385648E	02	211	-0.5907967E
213	0.2961685E	02	214	0.6121848E	02	215	-0.5427914E
217	-0.1608750E	03	218	-0.1351854E	03	219	-0.1116203E
221	-0.8076382E	02	222	-0.7392604E	02	223	-0.5664043E
225	0.1300405E	03	226	0.1666460E	03	227	0.1202921E
229	-0.7747850E	02	230	-0.8512218E	02	231	-0.1343124E
233	-0.5013968E	02	234	-0.2741006E	02	235	0.6473381E
237	0.1198984E	03	238	-0.1899986E	02	239	-0.1542101E
241	-0.2118845E	02	242	-0.4116263E	01	243	0.2803539E
245	0.7806154E	02	246	0.3984454E	02	247	0.3102722E
249	-0.4202573E	02	250	-0.3763808E	02	251	-0.6180948E
253	-0.2416280E	02	254	0.1620760E	02	255	0.5250546E
257	0.1121081E	03	258	0.1265900E	03	259	0.1146293E
261	0.8842828E	02	262	0.2734305E	02	263	-0.4037839E
265	-0.3106557E	02	266	0.5486095E	02	267	0.6646179E
269	-0.1898106E	02	270	-0.2142188E	02	271	-0.4502005E
273	-0.5835921E	02	274	-0.4432425E	02	275	-0.4017439E
277	0.1451343E	02	278	0.2992892E	02	279	0.2568643E
281	0.3673996E	02	282	0.6873338E	02	283	0.5572923E
285	-0.2357251E	02	286	-0.3399684E	02	287	-0.5226750E
289	-0.3704599E	02	290	0.2039660E	01	291	0.4456389E
293	-0.3326257E	02	294	-0.3066747E	02	295	-0.5449945E
297	-0.4131557E	02	298	-0.3995930E	02	299	-0.3777640E
301	-0.1941260E	02	302	-0.1047178E	02	303	-0.4088036E
305	-0.1246538E	02	306	-0.1905904E	02	307	-0.3113535E
309	-0.1318899E	02	310	-0.1345673E	02	311	-0.2136989E
313	-0.2576173E	02	314	-0.2432251E	02	315	-0.2435515E
317	-0.1167372E	02	318	-0.5528872E	01	319	-0.1312785E
321	-0.2076627E	02	322	-0.1647455E	02	323	-0.1529298E
325	-0.6501739E	01	326	-0.4723263E	00	327	-0.6606000E
329	-0.6523868E	01	330	-0.4245688E	01	331	-0.4957370E
333	-0.4025389E	01	334	-0.2122842E	01	335	-0.2640611E
337	-0.3935026E	01	338	-0.3676144E	01	339	-0.2744165E
341	-0.3158376E	01	342	-0.2692385E	01	343	-0.1863960E
345	-0.3158376E	01	346	-0.3003047E	01	347	-0.2329949E
349	0.0		350	0.0		351	0.0
353	0.0		354	0.0		355	0.0
357	0.0		358	0.0		359	0.0
						204	0.5634470E
						208	-0.2713013E
						212	0.7525983E
						216	-0.7789441E
						220	-0.6962468E
						224	0.1650710E
						228	-0.2911891E
						232	-0.2425932E
						236	0.1717136E
						240	-0.1555161E
						244	-0.8027703E
						248	-0.4042715E
						252	-0.5413760E
						256	0.1003087E
						260	0.1131138E
						264	-0.8172639E
						268	0.1656020E
						272	-0.6087320E
						276	-0.1947159E
						280	0.2370882E
						284	0.1265706E
						288	-0.4523267E
						292	-0.5517288E
						296	-0.4630023E
						300	-0.3539813E
						304	0.1802655E
						308	-0.2149117E
						312	-0.2542072E
						316	-0.1954831E
						320	-0.1796892E
						324	-0.4820725E
						328	-0.5404065E
						332	-0.4232496E
						336	-0.3883251E
						340	-0.3210155E
						344	-0.1553300E
						348	-0.2071068E
						352	0.0
						356	0.0
						360	0.0

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TABLE A-11
 ALGORITHM FOR ESTIMATING FOURTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT + MAGNETIC (C)

$$\text{COEFFICIENT-4} = 25.16 + \frac{(\sum \text{SALG(I)} * \text{SN(I+180)}) / \sqrt{\sum \text{SN}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{SV(I-180)}) / \sqrt{\sum \text{SN}^2(\text{I})}} + \frac{(\sum \text{SALG(I)} * \text{AA(I)}) / \sqrt{\sum \text{AA}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{S180(I)}) / \sqrt{\sum \text{S180}^2(\text{I})}}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.1323881E 00	2	-0.1647305E 01	3	-0.4837405E 01	4	-0.8104512E 01
5	-0.1024116E 02	6	-0.9093322E 01	7	-0.1017705E 02	8	-0.1115158E 02
9	-0.1087303E 02	10	-0.8333638E 01	11	-0.3694481E 01	12	-0.6775873E 01
13	-0.7459584E 01	14	-0.1181388E 02	15	-0.1262784E 02	16	-0.1838943E 02
17	-0.1992133E 02	18	-0.2052698E 02	19	-0.2151553E 02	20	-0.2373095E 02
21	-0.2381303E 02	22	-0.2713171E 02	23	-0.2525883E 02	24	-0.2729756E 02
25	-0.1957423E 02	26	-0.1505634E 02	27	-0.1248863E 02	28	-0.1342121E 02
29	-0.1031738E 02	30	-0.1024701E 02	31	-0.6622397E 01	32	-0.1589728E 02
33	-0.1267804E 02	34	-0.1768869E 02	35	-0.1435952E 02	36	-0.2039914E 02
37	-0.1778946E 02	38	-0.1988100E 02	39	-0.1521540E 02	40	-0.7641907E 01
41	0.2145112E 01	42	0.1273935E 02	43	0.1038036E 02	44	0.9132696E 01
45	0.7262912E 01	46	0.1652023E 02	47	0.1022743E 02	48	0.4406263E 01
49	-0.5259821E 01	50	0.1740006E 00	51	0.5440586E 01	52	0.3572542E 01
53	-0.6287999E 01	54	-0.7884336E 01	55	-0.4268388E 01	56	0.7049235E 01
57	0.6285516E 01	58	0.3169455E 01	59	-0.3355658E 01	60	-0.6340352E 01
61	-0.5611828E 01	62	-0.3173300E 00	63	0.1442430E 01	64	0.6251796E 00
65	0.1901318E 01	66	0.5344751E 01	67	0.1150587E 02	68	0.1255600E 02
69	0.1169873E 02	70	0.2006562E 01	71	-0.7443635E 00	72	-0.2576942E 01
73	0.1048258E 02	74	0.1279936E 02	75	0.1539371E 02	76	0.1067000E 02
77	0.1189954E 02	78	0.1249226E 02	79	0.1181823E 02	80	0.1082378E 02
81	0.1018363E 02	82	0.1307480E 02	83	0.1373676E 02	84	0.8756629E 01
85	0.1409712E 01	86	-0.3574010E 01	87	-0.1424959E 01	88	0.5492244E 01
89	0.1134558E 02	90	0.1941939E 02	91	0.2209541E 02	92	0.2435498E 02
93	0.2365958E 02	94	0.2355879E 02	95	0.2342567E 02	96	0.2147163E 02
97	0.1923529E 02	98	0.1869414E 02	99	0.1381188E 02	100	0.9476622E 01
101	0.7249214E 01	102	0.8249136E 01	103	0.1025829E 02	104	0.9063807E 01
105	0.1099852E 02	106	0.1164481E 02	107	0.8230897E 01	108	0.3098521E 01
109	0.2514583E 01	110	0.6673882E 01	111	0.8706660E 01	112	0.6129624E 01
113	0.4674247E 01	114	0.6856606E 01	115	0.7651958E 01	116	0.9111645E 01
117	0.9590983E 01	118	0.1102674E 02	119	0.1309811E 02	120	0.1317742E 02
121	0.1457606E 02	122	0.1358601E 02	123	0.1217476E 02	124	0.1121311E 02
125	0.9065714E 01	126	0.6861313E 01	127	0.4434660E 01	128	0.2879304E 01
129	0.3813657E 01	130	0.4024129E 01	131	0.4777678E 01	132	0.7266085E 01
133	0.7223033E 01	134	0.5945214E 01	135	0.4404018E 01	136	0.3830502E 01
137	0.3728297E 01	138	0.2377325E 01	139	0.2822409E 00	140	0.2113086E 00
141	0.2569158E 00	142	0.4452410E 00	143	0.2398303E 00	144	0.1727016E 00
145	0.3342719E -01	146	-0.1082973E -01	147	-0.2237628E -01	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	0.6386943E 00	182	0.1514433E 01	183	0.1899254E 01	184	0.3267107E 01
185	0.4229468E 01	186	0.4459312E 01	187	0.3448810E 01	188	0.3917823E 01
189	0.4597939E 01	190	0.5371676E 01	191	0.2040597E 01	192	0.1967994E 01
193	0.1450050E 01	194	0.5208386E 01	195	0.6993491E 01	196	0.8738913E 01
197	0.1135583E 02	198	0.1318870E 02	199	0.1480443E 02	200	0.1285882E 02

TABLE A-11 (CONT.)
 ALGORITHM FOR ESTIMATING FOURTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT + MAGNETIC (C)

$$C \text{ COEFFICIENT-4} = 25.16 + \frac{(\sum \text{SALG}(I) * \text{SN}(I+180)) / \sqrt{\sum \text{SN}^2(I)}}{\sqrt{\sum \text{SALG}^2(I)}} + \frac{(\sum \text{SALG}(I) * \text{AA}(I)) / \sqrt{\sum \text{AA}^2(I)}}{\sqrt{\sum \text{SALG}^2(I)}} + \frac{(\sum \text{SALG}(I) * \text{S180}(I)) / \sqrt{\sum \text{S180}^2(I)}}{\sqrt{\sum \text{SALG}^2(I)}}$$

 CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	0.9434712E	01	202	0.1037630E	02	203	0.9780632E
205	0.5541313E	01	206	0.1198524E	01	207	-0.3257773E
209	0.5793121E	01	210	0.1032468E	02	211	0.1680400E
213	0.1685515E	02	214	0.9781950E	01	215	0.3725395E
217	-0.1575219E	01	218	0.2435412E	01	219	0.5023250E
221	0.1511570E	02	222	0.1999457E	02	223	0.1986348E
225	0.2897431E	00	226	-0.7674124E	01	227	-0.5524391E
229	-0.5934849E	01	230	-0.7263786E	01	231	-0.1702245E
233	-0.1789119E	02	234	-0.1033743E	02	235	-0.1470397E
237	-0.9988134E	01	238	0.3147069E	01	239	0.6734263E
241	-0.3528737E	01	242	-0.9724565E	01	243	-0.1018052E
245	-0.4443018E	01	246	-0.9092566E	01	247	-0.1166218E
249	-0.4682075E	01	250	-0.7411882E	01	251	-0.7097734E
253	-0.1033245E	02	254	-0.1459632E	02	255	-0.8676040E
257	0.3887866E	01	258	0.4083381E	01	259	-0.1396342E
261	-0.7002367E	01	262	-0.8823527E	01	263	-0.4391319E
265	0.7499552E	00	266	-0.7984419E	00	267	0.1308179E
269	-0.9700304E	00	270	-0.1197104E	01	271	0.1807317E
273	-0.1975469E	01	274	-0.3303240E	01	275	-0.2809136E
277	-0.3647249E	01	278	-0.5802327E	01	279	-0.1032861E
281	0.1347343E	01	282	0.4863791E	01	283	0.4634305E
285	0.2518144E	01	286	-0.3803371E	01	287	-0.1780670E
289	0.9380009E	01	290	0.6088296E	01	291	0.5065122E
293	0.8234856E	01	294	0.6670422E	01	295	0.4897277E
297	0.3124478E	01	298	0.4652617E	01	299	0.4416198E
301	0.1985092E	01	302	0.1488823E	01	303	0.1788013E
305	-0.9668620E	00	306	-0.1510625E	01	307	0.1621285E
309	0.2004548E	01	310	0.6844528E	00	311	0.1747736E
313	0.1471173E	01	314	0.1678570E	01	315	0.1637160E
317	0.3340485E	00	318	-0.2853772E	00	319	-0.1333381E
321	-0.7696557E	-01	322	-0.1969178E	00	323	-0.9935999E
325	0.1845621E	00	326	0.2715663E	00	327	0.9009302E
329	0.0		330	0.0		331	0.0
333	0.0		334	0.0		335	0.0
337	0.0		338	0.0		339	0.0
341	0.0		342	0.0		343	0.0
345	0.0		346	0.0		347	0.0
349	0.0		350	0.0		351	0.0
353	0.0		354	0.0		355	0.0
357	0.0		358	0.0		359	0.0
361	-0.9895505E	00	362	0.7378292E	01	363	-0.7655775E
365	-0.1337199E	01	366	0.6887747E	01	367	-0.8059149E
369	-0.1712565E	01	370	0.1621886E	01	371	0.2811613E
373	0.1057964E	02	374	0.6132439E	01	375	0.7054274E
377	0.5409050E	01	378	-0.1898649E	01	379	-0.3969722E
381	-0.4506487E	01	382	-0.1662271E	02	383	-0.2451176E
385	-0.5541271E	01	386	-0.2024980E	02	387	0.3172364E
389	0.1172277E	02	390	0.9131318E	01	391	-0.1342020E
393	0.1088207E	02	394	-0.1025845E	02	395	-0.7466573E
397	-0.3975348E	01	398	-0.1064739E	02	399	-0.1274415E
						400	-0.3982093E

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TABLE A-11 (CONT.)
 ALGORITHM FOR ESTIMATING FOURTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT + MAGNETIC (C)

$$\text{COEFFICIENT-4} = 25.16 + \frac{\{ \sum \text{SALG}(I) * \text{SN}(I+180) \} / \sqrt{\sum \text{SN}^2(I)}}{\{ \sum \text{SALG}(I) * \text{SN}(I-180) \} / \sqrt{\sum \text{SN}^2(I)}} + \frac{\{ \sum \text{SALG}(I) * \text{AA}(I) \} / \sqrt{\sum \text{AA}^2(I)}}{\{ \sum \text{SALG}(I) * \text{S180}(I) \} / \sqrt{\sum \text{S180}^2(I)}}$$

 CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
401	0.4041841E 00	402	0.1238644E 01	403	-0.1736686E 01	404	-0.2998105E 01
405	-0.5421957E 01	406	-0.1183039E 01	407	0.9934009E 01	408	-0.3792476E 01
409	0.6475863E 01	410	0.1693451E 02	411	0.6286632E 01	412	-0.8684587E 01
413	-0.2540311E 02	414	0.8113573E 01	415	0.1496326E 01	416	-0.9593662E 01
417	0.5479053E 01	418	0.7747040E 01	419	0.6928408E 01	420	-0.1364140E 02
421	-0.4125147E 01	422	0.4331040E 01	423	0.7022116E 01	424	0.8051862E 01
425	-0.1373331E 01	426	0.3714513E 01	427	0.1118188E 02	428	-0.1173336E 01
429	0.5756454E 01	430	0.6282272E 01	431	0.3309956E 01	432	-0.5312573E 01
433	-0.1858168E 02	434	-0.2404866E 02	435	-0.2846596E 02	436	-0.1239584E 02
437	-0.1224285E 02	438	-0.2986290E 02	439	-0.2143855E 02	440	-0.1296671E 02
441	-0.7292046E 01	442	0.9635925E 00	443	-0.6703238E 01	444	-0.1058133E 00
445	-0.2774736E 01	446	0.1733829E 01	447	0.3627466E 01	448	0.2773239E 01
449	0.1537486E 01	450	-0.1193842E 01	451	-0.1188497E 02	452	-0.2068167E 02
453	-0.2099184E 02	454	-0.8663716E 01	455	-0.2137094E 02	456	0.6128150E 01
457	-0.1883336E 02	458	-0.2325203E 02	459	-0.7915532E 01	460	0.4140845E 01
461	0.9108855E 01	462	0.3234477E 01	463	0.3426859E 01	464	0.1745911E 02
465	0.1209014E 02	466	0.1066480E 02	467	0.5139043E 01	468	-0.3022682E 01
469	-0.1612970E 00	470	-0.1018500E 01	471	-0.9528719E 01	472	-0.4988091E 01
473	0.8738875E 01	474	0.5670526E 01	475	0.7811853E 01	476	0.8908461E 01
477	0.9097478E 01	478	0.1040254E 02	479	0.3436314E 02	480	0.3555919E 02
481	0.3676328E 02	482	0.4217287E 02	483	0.3341139E 02	484	0.3950926E 02
485	0.3762050E 02	486	0.3612108E 02	487	0.3627577E 02	488	0.2789096E 02
489	0.2195775E 02	490	0.2734834E 02	491	0.1977184E 02	492	0.1548749E 02
493	0.1583011E 02	494	0.1658018E 02	495	0.3012941E 02	496	0.2278519E 02
497	0.2583804E 02	498	0.2851773E 02	499	0.3378983E 01	500	0.4221158E 01
501	0.3558944E 01	502	0.3743404E 01	503	0.4921721E 01	504	0.3241869E 01
505	0.2920511E 01	506	0.4618572E 01	507	-0.2545154E 00	508	0.0
509	0.0	510	0.0	511	0.0	512	0.0
513	0.0	514	0.0	515	0.0	516	0.0
517	0.0	518	0.0	519	0.0	520	0.0
521	0.0	522	0.0	523	0.0	524	0.0
525	0.0	526	0.0	527	0.0	528	0.0
529	0.0	530	0.0	531	0.0	532	0.0
533	0.0	534	0.0	535	0.0	536	0.0
537	0.0	538	0.0	539	0.0	540	0.0
541	0.6500322E 01	542	0.3240994E 02	543	-0.1855898E 01	544	-0.3587435E 01
545	0.6374900E 01	546	-0.8685875E 01	547	-0.4951096E 02	548	0.2678615E 02
549	0.1409455E 02	550	-0.7159353E 01	551	-0.5667782E 01	552	-0.1375893E 02
553	0.6371853E 01	554	0.5007181E 01	555	0.1194564E 01		

TABLE A-12
ALGORITHM FOR ESTIMATING FIFTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-5} = 52.63 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.3016286E	01	2	0.7241225E	01	3	0.1772496E
5	0.1767711E	02	6	0.9109933E	01	7	0.1246018E
9	0.1200806E	02	10	0.9337728E	00	11	-0.6277989E
13	0.1569794E	02	14	0.1643645E	02	15	0.7284058E
17	0.2654166E	02	18	0.2088562E	02	19	0.3369429E
21	0.6121252E	02	22	0.5854616E	02	23	0.4034813E
25	0.2071111E	02	26	0.8432619E	-02	27	-0.2203020E
29	-0.1900027E	02	30	-0.1013506E	02	31	-0.1149916E
33	-0.3383614E	02	34	-0.4220644E	02	35	-0.5781551E
37	0.1081536E	00	38	0.2375589E	02	39	0.1463142E
41	-0.6205789E	02	42	-0.1052157E	03	43	-0.8180357E
45	0.1748779E	02	46	-0.1568365E	02	47	-0.1464093E
49	-0.1392210E	02	50	-0.3636823E	02	51	-0.7616345E
53	-0.6339488E	01	54	0.5951086E	02	55	0.8518324E
57	0.4477507E	02	58	0.2161508E	02	59	0.9848382E
61	0.8988051E	02	62	0.6677397E	02	63	0.2588675E
65	-0.1823862E	02	66	0.2313443E	01	67	0.3611732E
69	-0.1639563E	02	70	0.4000035E	02	71	0.3335081E
73	-0.4050380E	02	74	-0.4087810E	02	75	-0.5684599E
77	-0.5531532E	02	78	-0.5943573E	02	79	-0.2806476E
81	-0.7394387E	01	82	-0.4025162E	02	83	-0.3249121E
85	0.2293117E	02	86	0.3392593E	02	87	0.2823682E
89	-0.2655756E	02	90	-0.7552501E	02	91	-0.8588962E
93	-0.5077365E	02	94	-0.2618550E	02	95	-0.1881927E
97	-0.1604990E	02	98	-0.2182361E	02	99	0.6545661E
101	0.1848126E	02	102	-0.8067992E	01	103	-0.3531262E
105	-0.3473419E	02	106	-0.1025690E	02	107	0.3768587E
109	0.2551460E	02	110	0.1422704E	02	111	-0.4195808E
113	0.1859779E	01	114	0.1504806E	02	115	0.1514288E
117	0.1942352E	02	118	0.6844346E	01	119	0.1122887E
121	0.1835319E	01	122	-0.1658256E	01	123	-0.1978775E
125	-0.3869111E	01	126	0.2434848E	02	127	0.2021573E
129	-0.9721352E	00	130	-0.2069317E	01	131	0.4283782E
133	0.5684216E	01	134	-0.2636473E	00	135	0.4898600E
137	0.1707495E	02	138	0.2245947E	02	139	0.2327629E
141	0.2096161E	02	142	0.2286452E	02	143	0.2340056E
145	0.1507734E	02	146	0.6394498E	01	147	0.1545067E
149	0.1391288E	02	150	0.9054409E	01	151	0.1029085E
153	0.8303296E	01	154	0.4527201E	01	155	0.5631397E
157	0.8391891E	01	158	0.7839792E	01	159	0.5852239E
161	0.6735595E	01	162	0.5741817E	01	163	0.3975106E
165	0.6735595E	01	166	0.6404336E	01	167	0.4968880E
169	0.0		170	0.0		171	0.0
173	0.0		174	0.0		175	0.0
177	0.0		178	0.0		179	0.0
181	-0.2705036E	01	182	-0.3167114E	01	183	-0.5914964E
185	-0.4203566E	01	186	0.5153930E	01	187	0.8640435E
189	-0.9401140E	01	190	-0.1950604E	02	191	-0.2769479E
193	-0.1828592E	02	194	-0.7908877E	01	195	-0.8871957E
197	-0.1632565E	01	198	0.7440319E	01	199	-0.9071279E
						200	-0.4868607E

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TABLE A-12 (CONT.)
ALGORITHM FOR ESTIMATING FIFTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-5} = 52.63 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	-0.2284622E 02	202	-0.3829886E 02	203	-0.3435815E 02	204	-0.1129702E 02
205	-0.2117760E 01	206	0.1772040E 02	207	-0.3192729E 01	208	-0.1488951E 02
209	-0.5074593E 02	210	-0.3464322E 02	211	-0.1626302E 02	212	0.9193982E 01
213	-0.1992455E 01	214	-0.4332412E 01	215	-0.8612484E 01	216	0.1490397E 02
217	0.2462994E 02	218	0.2144478E 02	219	0.8929008E 01	220	-0.2218271E 02
221	0.8091156E 01	222	-0.2363977E 02	223	0.6407746E 00	224	0.6581004E 01
225	0.7741504E 02	226	0.6779480E 02	227	0.7610376E 02	228	0.2799004E 01
229	-0.6576610E 01	230	-0.7596437E 02	231	-0.4942383E 02	232	-0.7300925E 02
233	-0.2168700E 02	234	0.5760345E 01	235	0.3617410E 02	236	0.5204218E 02
237	0.3468965E 02	238	0.5227769E 01	239	-0.3820908E 02	240	-0.3644463E 02
241	0.1259161E 02	242	-0.4007484E 01	243	-0.2876897E 02	244	-0.7220493E 02
245	-0.4275047E 02	246	-0.3996550E 02	247	0.1202782E 01	248	0.7030513E 01
249	0.1938643E 02	250	0.2352075E 02	251	0.2042140E 02	252	0.1220062E 01
253	-0.5747556E 02	254	-0.9112041E 02	255	-0.1109689E 03	256	-0.6607880E 02
257	-0.3875375E 02	258	0.3449051E 01	259	0.1307810E 02	260	0.1608626E 02
261	0.4489568E 02	262	0.2312222E 02	263	0.3630049E 02	264	0.1397259E 02
265	0.6043289E 02	266	0.5416154E 02	267	0.4909525E 02	268	0.1640723E 02
269	-0.1946974E 02	270	-0.3980325E 02	271	-0.5972618E 02	272	-0.3356799E 02
273	-0.1899307E 02	274	0.5097518E 01	275	0.1803162E 02	276	0.3187839E 02
277	0.3723187E 02	278	0.3195374E 02	279	0.4381909E 02	280	0.4663441E 02
281	0.5946112E 02	282	0.5976801E 02	283	0.6902147E 02	284	0.6254536E 02
285	0.2827057E 02	286	-0.6131729E 01	287	-0.2839143E 02	288	-0.6790273E 01
289	0.1604626E 02	290	0.1925909E 02	291	0.3573000E 02	292	0.3264543E 02
293	0.4207326E 02	294	0.1116341E 02	295	-0.6802477E 01	296	-0.1462959E 02
297	-0.6558898E 01	298	0.2941962E 01	299	0.2056790E 01	300	-0.4036723E 01
301	-0.1719537E 01	302	0.3988229E 00	303	0.1035729E 02	304	-0.4450611E 01
305	-0.2339246E 02	306	-0.3247308E 02	307	-0.2165416E 02	308	-0.1414171E 02
309	-0.1304615E 02	310	-0.1981311E 02	311	-0.1542081E 02	312	-0.1145922E 02
313	-0.1118176E 02	314	-0.1056015E 02	315	-0.1024033E 02	316	-0.9917115E 01
317	-0.1055346E 02	318	-0.1350071E 02	319	-0.1612819E 02	320	-0.1810471E 02
321	-0.1872249E 02	322	-0.1748859E 02	323	-0.1626784E 02	324	-0.7075160E 01
325	-0.7060081E 01	326	0.6448147E 00	327	-0.6984826E 01	328	-0.6190301E 01
329	-0.7472525E 01	330	-0.4863070E 01	331	-0.5679053E 01	332	-0.4848774E 01
333	-0.4611550E 01	334	-0.2431534E 01	335	-0.3024592E 01	336	-0.4447931E 01
337	-0.4507236E 01	338	-0.4210706E 01	339	-0.3143203E 01	340	-0.3676957E 01
341	-0.3617648E 01	342	-0.3083896E 01	343	-0.2135005E 01	344	-0.1779171E 01
345	-0.3617648E 01	346	-0.3439732E 01	347	-0.2668756E 01	348	-0.2372229E 00
349	0.0	350	0.0	351	0.0	352	0.0
353	0.0	354	0.0	355	0.0	356	0.0
357	0.0	358	0.0	359	0.0	360	0.0

TABLE A-13
 ALGORITHM FOR ESTIMATING FIFTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT + MAGNETIC (C)

$$\text{COEFFICIENT-5} = -33.38 + \frac{(\sum \text{SALG(I)} * \text{SN(I+180)}) / \sqrt{\sum \text{SN}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{SN(I-180)}) / \sqrt{\sum \text{SN}^2(\text{I})}} + \frac{(\sum \text{SALG(I)} * \text{AA(I)}) / \sqrt{\sum \text{AA}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{S180(I)}) / \sqrt{\sum \text{S180}^2(\text{I})}}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.2069842E 00	2	0.9758770E-01	3	0.1076982E 01	4	0.1133856E 01
5	-0.6039963E 00	6	-0.4229855E 00	7	0.5385944E 00	8	0.1727868E 01
9	-0.1240113E 01	10	-0.4647097E 01	11	-0.1298590E 02	12	-0.1489844E 02
13	-0.1460596E 02	14	-0.1018881E 02	15	-0.8166229E 01	16	-0.3547455E 01
17	-0.7293247E 01	18	-0.1103043E 02	19	-0.1631932E 02	20	-0.9029140E 01
21	-0.3294380E 01	22	0.3190392E 01	23	0.4741857E 01	24	0.6174520E 01
25	0.3405080E 01	26	-0.2211725E 01	27	-0.3290488E 01	28	0.2909703E 01
29	0.6006914E 01	30	0.7450678E 01	31	0.1301882E 01	32	-0.2096688E 01
33	-0.1262591E 02	34	-0.1429639E 02	35	-0.4957808E 01	36	0.4902191E 01
37	0.1040275E 02	38	0.3785590E 01	39	0.2388821E 01	40	-0.1100810E 01
41	0.2947195E 01	42	-0.2129410E 01	43	0.6364652E 01	44	0.1595963E 02
45	0.3486739E 02	46	0.2833952E 02	47	0.1933937E 02	48	0.1295392E 01
49	-0.3310658E 01	50	-0.1682503E 02	51	-0.5173684E 01	52	-0.3076491E 01
53	0.1862021E 02	54	0.2438438E 02	55	0.2586264E 02	56	0.2085274E 02
57	-0.8860076E 01	58	-0.1532173E 02	59	-0.2346556E 02	60	-0.4868770E 00
61	0.4810623E 01	62	0.3925718E 01	63	-0.3439037E 01	64	-0.1686331E 02
65	-0.1546270E 02	66	-0.1473845E 02	67	-0.1808733E 01	68	0.5444636E 01
69	0.1609105E 02	70	0.2536487E 02	71	0.1995413E 02	72	0.6402210E 01
73	-0.9986279E 01	74	-0.1445919E 02	75	-0.2570871E 02	76	-0.2834528E 02
77	-0.2581682E 02	78	-0.1413044E 02	79	-0.2524036E 01	80	-0.5332767E 01
81	0.5014373E-01	82	-0.8944307E 01	83	-0.7229898E 01	84	-0.1391927E 02
85	-0.8629649E 01	86	-0.9705420E 01	87	-0.6467180E 01	88	-0.9511261E 01
89	-0.1671982E 02	90	-0.2498206E 02	91	-0.2540617E 02	92	-0.1104995E 02
93	0.3444142E 01	94	0.1629329E 02	95	0.2039622E 02	96	0.1815887E 02
97	0.1383508E 02	98	0.8324121E 01	99	0.7273896E 01	100	0.6916165E 01
101	0.5139068E 01	102	0.5634852E 01	103	0.3455515E 01	104	0.7071300E 01
105	0.6981819E 01	106	0.6821115E 01	107	0.1872863E 01	108	0.4250449E 01
109	0.8397568E 01	110	0.1124406E 02	111	0.1013584E 02	112	0.9528629E 01
113	0.1294824E 02	114	0.1141364E 02	115	0.8726538E 01	116	0.7666457E 01
117	0.9041352E 01	118	0.8520895E 01	119	0.6992383E 01	120	0.3964134E 01
121	0.6171678E 01	122	0.5286399E 01	123	0.5525354E 01	124	0.1799928E 01
125	-0.1791497E 01	126	-0.3814731E 01	127	-0.3563839E 01	128	-0.3805991E 01
129	-0.2743230E 01	130	-0.2023331E 01	131	-0.9766108E 00	132	0.8120030E 00
133	0.1323324E 01	134	0.1499557E 01	135	0.1649330E 01	136	0.1513289E 01
137	0.1140058E 01	138	0.4621106E 00	139	0.8210415E-01	140	0.2162409E 00
141	0.1733317E 00	142	0.1593292E 00	143	0.1007211E 00	144	0.6108533E 00
145	0.4545476E 00	146	0.5884190E 00	147	0.1700443E 00	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	0.1255217E 00	182	0.1376912E 01	183	0.5275953E 01	184	0.7937866E 01
185	0.1121950E 02	186	0.6755189E 01	187	0.8051553E 01	188	0.7603257E 01
189	0.1130716E 02	190	0.8393285E 01	191	0.3368859E 01	192	0.4833593E 01
193	0.4885901E 01	194	0.5190900E 01	195	-0.8203956E 00	196	-0.2806131E 01
197	0.2462108E 01	198	0.3989277E 01	199	0.7238630E 01	200	0.9657724E 01

TABLE A-13(CONT.)
 ALGORITHM FOR ESTIMATING FIFTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT + MAGNETIC (C)

$$\text{COEFFICIENT-5} = -33.38 + \frac{(\sum \text{SALG(I)} * \text{SN(I-180)}) / \sqrt{\sum \text{SN}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{SI80(I)}) / \sqrt{\sum \text{SI80}^2(\text{I})}} + \frac{(\sum \text{SALG(I)} * \text{SN(I+180)}) / \sqrt{\sum \text{SN}^2(\text{I})}}{(\sum \text{SALG(I)} * \text{AA(I)}) / \sqrt{\sum \text{AA}^2(\text{I})}} +$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)	
201	0.1923096E	02	202	0.2523027E	02	203	0.1908328E	02
205	0.8529772E	01	206	0.5893747E	01	207	0.2868680E	01
209	-0.3890029E	01	210	0.1003430E	-01	211	0.8116862E	00
213	0.7850039E	01	214	0.1180610E	02	215	0.1020763E	02
217	0.1450038E	02	218	0.8421472E	01	219	-0.8021913E	01
221	-0.2410876E	02	222	-0.2792378E	02	223	-0.3038472E	02
225	-0.2738589E	02	226	-0.3020793E	02	227	-0.2124113E	02
229	0.1777646E	02	230	0.1500787E	02	231	-0.5397640E	-01
233	0.8206255E	01	234	0.1136234E	02	235	0.1789999E	02
237	0.9415690E	01	238	0.3308455E	01	239	0.7538629E	01
241	0.1984443E	01	242	0.5323448E	00	243	0.2454168E	01
245	0.1019886E	02	246	0.9054232E	01	247	-0.7146904E	01
249	-0.1136455E	02	250	0.7586657E	01	251	0.1092463E	02
253	0.5981051E	01	254	0.9383272E	01	255	0.7005409E	01
257	-0.2211996E	01	258	-0.1108997E	02	259	-0.1080050E	02
261	-0.1197983E	02	262	-0.1406144E	02	263	-0.1570040E	02
265	0.1486021E	00	266	0.6597030E	01	267	0.6246770E	01
269	0.2162327E	01	270	-0.9510624E	01	271	-0.1266453E	02
273	-0.1513907E	02	274	-0.1814258E	02	275	-0.2129376E	02
277	-0.1382869E	02	278	-0.1100881E	02	279	-0.6351748E	01
281	-0.1077686E	02	282	-0.1425585E	02	283	-0.1976517E	02
285	-0.1144174E	02	286	-0.6811240E	01	287	-0.2715978E	01
289	-0.3288568E	01	290	-0.6504429E	01	291	-0.9427516E	01
293	-0.9596442E	01	294	-0.8443363E	01	295	-0.7723367E	01
297	-0.9108183E	01	298	-0.9815113E	01	299	-0.1112116E	02
301	-0.1293418E	02	302	-0.1306072E	02	303	-0.1237661E	02
305	-0.8371294E	01	306	-0.6332698E	01	307	-0.6644271E	01
309	-0.5767591E	01	310	-0.3523675E	01	311	-0.2329092E	01
313	-0.2245240E	01	314	-0.4357444E	01	315	-0.4646566E	01
317	-0.2390880E	01	318	-0.1187373E	01	319	-0.1396975E	01
321	-0.1783995E	01	322	-0.2358663E	01	323	-0.1347919E	01
325	-0.2477073E	01	326	-0.3020618E	01	327	-0.8067459E	00
329	0.0		330	0.0		331	0.0	
333	0.0		334	0.0		335	0.0	
337	0.0		338	0.0		339	0.0	
341	0.0		342	0.0		343	0.0	
345	0.0		346	0.0		347	0.0	
349	0.0		350	0.0		351	0.0	
353	0.0		354	0.0		355	0.0	
357	0.0		358	0.0		359	0.0	
361	0.5251935E	01	362	0.6297921E	01	363	0.8187553E	01
365	0.4134273E	01	366	0.3988108E	01	367	-0.3830223E	01
369	0.1144739E	02	370	0.5827503E	01	371	-0.2872520E	01
373	0.3881456E	01	374	-0.4864162E	00	375	-0.1002521E	02
377	-0.3475337E	02	378	-0.1813016E	02	379	-0.5097289E	01
381	-0.2272800E	02	382	-0.5530491E	01	383	0.1577570E	02
385	0.1150920E	02	386	0.3311593E	01	387	0.1131953E	02
389	0.3131923E	01	390	0.1262377E	02	391	0.9212608E	01
393	-0.2001147E	02	394	-0.2849973E	02	395	-0.1082208E	02
397	-0.2001147E	02	398	-0.2849973E	02	399	-0.1082208E	02
401	-0.2001147E	02	402	-0.2849973E	02	403	-0.1082208E	02
405	-0.2001147E	02	406	-0.2849973E	02	407	-0.1082208E	02
409	-0.2001147E	02	410	-0.2849973E	02	411	-0.1082208E	02
413	-0.2001147E	02	414	-0.2849973E	02	415	-0.1082208E	02
417	-0.2001147E	02	418	-0.2849973E	02	419	-0.1082208E	02
421	-0.2001147E	02	422	-0.2849973E	02	423	-0.1082208E	02
425	-0.2001147E	02	426	-0.2849973E	02	427	-0.1082208E	02
429	-0.2001147E	02	430	-0.2849973E	02	431	-0.1082208E	02
433	-0.2001147E	02	434	-0.2849973E	02	435	-0.1082208E	02
437	-0.2001147E	02	438	-0.2849973E	02	439	-0.1082208E	02
441	-0.2001147E	02	442	-0.2849973E	02	443	-0.1082208E	02
445	-0.2001147E	02	446	-0.2849973E	02	447	-0.1082208E	02
449	-0.2001147E	02	450	-0.2849973E	02	451	-0.1082208E	02
453	-0.2001147E	02	454	-0.2849973E	02	455	-0.1082208E	02
457	-0.2001147E	02	458	-0.2849973E	02	459	-0.1082208E	02
461	-0.2001147E	02	462	-0.2849973E	02	463	-0.1082208E	02
465	-0.2001147E	02	466	-0.2849973E	02	467	-0.1082208E	02
469	-0.2001147E	02	470	-0.2849973E	02	471	-0.1082208E	02
473	-0.2001147E	02	474	-0.2849973E	02	475	-0.1082208E	02
477	-0.2001147E	02	478	-0.2849973E	02	479	-0.1082208E	02
481	-0.2001147E	02	482	-0.2849973E	02	483	-0.1082208E	02
485	-0.2001147E	02	486	-0.2849973E	02	487	-0.1082208E	02
489	-0.2001147E	02	490	-0.2849973E	02	491	-0.1082208E	02
493	-0.2001147E	02	494	-0.2849973E	02	495	-0.1082208E	02
497	-0.2001147E	02	498	-0.2849973E	02	499	-0.1082208E	02
501	-0.2001147E	02	502	-0.2849973E	02	503	-0.1082208E	02
505	-0.2001147E	02	506	-0.2849973E	02	507	-0.1082208E	02
509	-0.2001147E	02	510	-0.2849973E	02	511	-0.1082208E	02
513	-0.2001147E	02	514	-0.2849973E	02	515	-0.1082208E	02
517	-0.2001147E	02	518	-0.2849973E	02	519	-0.1082208E	02
521	-0.2001147E	02	522	-0.2849973E	02	523	-0.1082208E	02
525	-0.2001147E	02	526	-0.2849973E	02	527	-0.1082208E	02
529	-0.2001147E	02	530	-0.2849973E	02	531	-0.1082208E	02
533	-0.2001147E	02	534	-0.2849973E	02	535	-0.1082208E	02
537	-0.2001147E	02	538	-0.2849973E	02	539	-0.1082208E	02
541	-0.2001147E	02	542	-0.2849973E	02	543	-0.1082208E	02
545	-0.2001147E	02	546	-0.2849973E	02	547	-0.1082208E	02
549	-0.2001147E	02	550	-0.2849973E	02	551	-0.1082208E	02
553	-0.2001147E	02	554	-0.2849973E	02	555	-0.1082208E	02
557	-0.2001147E	02	558	-0.2849973E	02	559	-0.1082208E	02
561	-0.2001147E	02	562	-0.2849973E	02	563	-0.1082208E	02
565	-0.2001147E	02	566	-0.2849973E	02	567	-0.1082208E	02
569	-0.2001147E	02	570	-0.2849973E	02	571	-0.1082208E	02
573	-0.2001147E	02	574	-0.2849973E	02	575	-0.1082208E	02
577	-0.2001147E	02	578	-0.2849973E	02	579	-0.1082208E	02
581	-0.2001147E	02	582	-0.2849973E	02	583	-0.1082208E	02
585	-0.2001147E	02	586	-0.2849973E	02	587	-0.1082208E	02
589	-0.2001147E	02	590	-0.2849973E	02	591	-0.1082208E	02
593	-0.2001147E	02	594	-0.2849973E	02	595	-0.1082208E	02
597	-0.2001147E	02	598	-0.2849973E	02	599	-0.1082208E	02
601	-0.2001147E	02	602	-0.2849973E	02	603	-0.1082208E	02
605	-0.2001147E	02	606	-0.2849973E	02	607	-0.1082208E	02
609	-0.2001147E	02	610	-0.2849973E	02	611	-0.1082208E	02
613	-0.2001147E	02	614	-0.2849973E	02	615	-0.1082208E	02
617	-0.2001147E	02	618	-0.2849973E	02	619	-0.1082208E	02
621	-0.2001147E	02	622	-0.2849973E	02	623	-0.1082208E	02
625	-0.2001147E	02	626	-0.2849973E	02	627	-0.1082208E	02
629	-0.2001147E	02	630	-0.2849973E	02	631	-0.1082208E	02
633	-0.2001147E	02	634	-0.2849973E	02	635	-0.1082208E	02
637	-0.2001147E	02	638	-0.2849973E	02	639	-0.1082208E	02
641	-0.2001147E	02	642	-0.2849973E	02	643	-0.1082208E	02
645	-0.2001147E	02	646	-0.2849973E	02	647	-0.1082208E	02
649	-0.2001147E	02	650	-0.2849973E	02	651	-0.1082208E	02
653	-0.2001147E	02	654	-0.2849973E	02	655	-0.1082208E	02
657	-0.2001147E	02	658	-0.2849973E	02	659	-0.1082208E	

TABLE A-13 (CONT.)
 ALGORITHM FOR ESTIMATING FIFTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
 PRECEDING SUNSPOT & MAGNETIC {C}

$$\text{COEFFICIENT-5} = -33.38 + \frac{(\sum \text{SALG}(I) * \text{SN}(I+180)) / \sqrt{\sum \text{SN}^2(I)}}{\sqrt{\sum \text{SN}^2(I)}} + \frac{(\sum \text{SALG}(I) * \text{AA}(I)) / \sqrt{\sum \text{AA}^2(I)}}{\sqrt{\sum \text{AA}^2(I)}} + \frac{(\sum \text{SALG}(I) * \text{S180}(I)) / \sqrt{\sum \text{S180}^2(I)}}{\sqrt{\sum \text{S180}^2(I)}}$$

 CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
401	0.6352633E	01	402	-0.9218679E	01	403	0.1616348E
405	-0.3655346E	02	406	-0.4077144E	01	407	0.2145157E
409	0.4261621E	00	410	0.4681342E	02	411	0.9295309E
413	0.1410840E	00	414	0.1022610E	02	415	-0.1207719E
417	-0.1601567E	02	418	0.4494313E	01	419	0.1493238E
421	0.1602454E	01	422	0.2028691E	01	423	0.5311289E
425	0.1704058E	01	426	0.8123516E	01	427	0.2283102E
429	-0.9941998E	01	430	-0.1277855E	02	431	0.3120792E
433	0.1306044E	02	434	0.2900697E	02	435	-0.1099615E
437	0.8610435E	01	438	0.8332240E	01	439	0.1514867E
441	-0.1199034E	02	442	-0.1860579E	02	443	-0.8403482E
445	-0.2072237E	01	446	0.3980186E	01	447	-0.1705396E
449	-0.2086661E	02	450	-0.6590858E	01	451	-0.1012729E
453	-0.1235072E	02	454	-0.1232909E	02	455	-0.2892342E
457	-0.2179030E	00	458	0.8639606E	00	459	-0.7834983E
461	-0.9542110E	01	462	-0.7461455E	01	463	-0.1512222E
465	-0.2140547E	02	466	-0.1594699E	02	467	-0.5358863E
469	0.1591017E	01	470	-0.2908023E	01	471	-0.5193545E
473	0.5965555E	01	474	0.1431843E	02	475	0.1601645E
477	0.3662137E	02	478	0.2992320E	02	479	0.2420479E
481	0.1543148E	02	482	0.2603195E	02	483	0.1198123E
485	0.6541007E	01	486	0.1634995E	01	487	-0.4444255E
489	-0.2575893E	02	490	-0.2293013E	02	491	-0.2013058E
493	-0.1575233E	02	494	0.6530901E	00	495	0.8783850E
497	0.7264500E	01	498	0.9873224E	01	499	0.3391399E
501	0.5976266E	00	502	0.4154080E	00	503	0.4043878E
505	0.1384105E	01	506	-0.1375059E	00	507	0.1934136E
509	0.0		510	0.0		511	0.0
513	0.0		514	0.0		515	0.0
517	0.0		518	0.0		519	0.0
521	0.0		522	0.0		523	0.0
525	0.0		526	0.0		527	0.0
529	0.0		530	0.0		531	0.0
533	0.0		534	0.0		535	0.0
537	0.0		538	0.0		539	0.0
541	-0.3736590E	01	542	0.6502825E	01	543	-0.6131929E
545	0.1232983E	02	546	-0.4388060E	01	547	0.3700648E
549	0.5027879E	02	550	0.6054239E	01	551	-0.1597412E
553	0.7399787E	01	554	0.1794737E	01	555	0.1809839E
						556	0.1809839E
						557	0.1809839E
						558	0.1809839E
						559	0.1809839E
						560	0.1809839E
						561	0.1809839E
						562	0.1809839E
						563	0.1809839E
						564	0.1809839E
						565	0.1809839E
						566	0.1809839E
						567	0.1809839E
						568	0.1809839E
						569	0.1809839E
						570	0.1809839E
						571	0.1809839E
						572	0.1809839E
						573	0.1809839E
						574	0.1809839E
						575	0.1809839E
						576	0.1809839E
						577	0.1809839E
						578	0.1809839E
						579	0.1809839E
						580	0.1809839E
						581	0.1809839E
						582	0.1809839E
						583	0.1809839E
						584	0.1809839E
						585	0.1809839E
						586	0.1809839E
						587	0.1809839E
						588	0.1809839E
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						593	0.1809839E
						594	0.1809839E
						595	0.1809839E
						596	0.1809839E
						597	0.1809839E
						598	0.1809839E
						599	0.1809839E
						600	0.1809839E

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TABLE A-14
ALGORITHM FOR ESTIMATING SIXTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-6} = 22.88 + \left(\sum_I \text{SALG}(I) * \text{SN}(I) \right) / \sqrt{\sum_I \text{SN}^2(I)}$$

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	0.2060240E 01	2	0.6265321E 00	3	0.1414861E 01	4	-0.1580805E 02
5	-0.3279854E 02	6	-0.3386649E 02	7	-0.1446065E 02	8	0.6213442E 01
9	0.3742882E 01	10	0.2643385E 01	11	0.9382970E 01	12	0.2178554E 02
13	0.2170613E 02	14	0.6709851E 01	15	-0.2996943E 01	16	-0.1863373E 02
17	0.1374487E 02	18	0.2376572E 02	19	0.3771458E 02	20	0.5555636E 00
21	-0.9673303E 01	22	-0.4338533E 02	23	-0.6192073E 02	24	-0.6105809E 02
25	-0.5671315E 02	26	-0.4160115E 02	27	-0.7603098E 02	28	-0.6553879E 02
29	-0.6135672E 02	30	-0.3588263E 02	31	-0.1856029E 02	32	0.5637662E 01
33	0.2183269E 02	34	0.4784846E 01	35	-0.3339577E 02	36	-0.2994638E 02
37	-0.2046498E 02	38	0.2995964E 02	39	0.6955951E 02	40	0.1088841E 03
41	0.7266026E 02	42	0.3144341E 02	43	0.9897473E 01	44	0.1755933E 02
45	0.1586950E 02	46	-0.7664587E 01	47	0.2050250E 02	48	0.2381825E 02
49	0.5370328E 02	50	0.9244719E 01	51	-0.3231125E 02	52	-0.7437404E 02
53	-0.7108109E 02	54	-0.6843942E 02	55	-0.9243436E 02	56	-0.1087375E 03
57	-0.4233501E 02	58	0.4195755E 02	59	0.7704665E 02	60	0.2823441E 02
61	0.2040134E 02	62	-0.1455152E 01	63	0.1807903E 02	64	0.2898535E 02
65	0.5757062E 02	66	0.5305464E 02	67	0.3019252E 02	68	0.1638336E 02
69	-0.1515301E 02	70	-0.4489816E 02	71	-0.4625179E 02	72	-0.2781383E 02
73	-0.2439601E 02	74	-0.3616271E 01	75	0.1022398E 02	76	0.1150629E 01
77	-0.1161167E 02	78	-0.1466217E 02	79	0.6790420E 01	80	-0.3628774E 01
81	-0.2417174E 02	82	-0.4573692E 02	83	-0.1039658E 02	84	0.3333000E 02
85	0.7061610E 02	86	0.5453629E 02	87	0.3661993E 02	88	0.3539345E 02
89	0.3684662E 02	90	0.4673686E 02	91	0.4628253E 02	92	0.4186774E 02
93	0.2557681E 02	94	-0.4716749E 01	95	-0.1975508E 02	96	-0.2134328E 02
97	-0.8158875E 01	98	-0.1446537E 02	99	0.2234115E 01	100	-0.2079880E 01
101	0.9579522E 01	102	-0.5009080E 01	103	0.3839989E 00	104	-0.1170735E 02
105	-0.1791942E 02	106	-0.4297578E 02	107	-0.3557796E 02	108	-0.3875377E 02
109	-0.1301146E 01	110	0.1531724E 02	111	0.2526199E 02	112	0.1034686E 02
113	-0.2471554E 01	114	0.7211477E 00	115	-0.2988152E 01	116	-0.4949822E 01
117	-0.1138881E 00	118	0.8805245E 01	119	0.7939365E 01	120	0.7803031E 01
121	-0.2599136E 01	122	-0.4228084E 01	123	-0.9947906E 01	124	-0.7055061E 01
125	-0.9578297E 01	126	-0.1963506E 02	127	-0.1741362E 02	128	-0.5905329E 01
129	0.9875299E 01	130	0.1023892E 02	131	0.9709663E 01	132	0.1106398E 00
133	0.6477354E 00	134	0.5729319E 01	135	0.9943581E 01	136	0.1040161E 02
137	0.7654652E 01	138	0.7538135E 01	139	0.1516195E 01	140	-0.3125308E 00
141	-0.3286125E 01	142	-0.5308585E 01	143	-0.7430601E 01	144	-0.1209017E 02
145	-0.1199391E 02	146	-0.1030075E 02	147	-0.8869738E 01	148	-0.4881477E 01
149	-0.5976510E 01	150	-0.3889474E 01	151	-0.4403068E 01	152	-0.3739010E 01
153	-0.3549281E 01	154	-0.1944735E 01	155	-0.2419062E 01	156	-0.3557446E 01
157	-0.3604877E 01	158	-0.3367715E 01	159	-0.2513927E 01	160	-0.2940821E 01
161	-0.2893389E 01	162	-0.2466495E 01	163	-0.1707573E 01	164	-0.1422977E 01
165	-0.2893389E 01	166	-0.2751089E 01	167	-0.2134466E 01	168	-0.1897303E 00
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0
181	0.2016472E 01	182	0.4358221E 01	183	-0.8231651E 00	184	-0.1310803E 02
185	-0.3695288E 02	186	-0.4330017E 02	187	-0.3807542E 02	188	-0.2603424E 02
189	-0.3374429E 02	190	-0.3226921E 02	191	-0.2527312E 02	192	0.2453932E 01
193	0.5749169E 01	194	-0.1107635E 02	195	-0.2686600E 02	196	-0.2814323E 02
197	-0.2389009E 01	198	0.1904439E 02	199	0.2052840E 02	200	0.9250645E 01

TABLE A-14 (CONT.)
ALGORITHM FOR ESTIMATING SIXTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING SUNSPOT NUMBER (SN)

$$\text{COEFFICIENT-6} = 22.88 * \left(\sum_I \text{SALG(I)} * \text{SN(I)} \right) \sqrt{\sum_I \text{SN}^2(\text{I})}$$

CONTINUED

I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
201	0.7943115E	01	202	-0.1478407E	02	203	-0.2800826E
205	-0.1060886E	02	206	0.2115376E	02	207	0.2291682E
209	0.1603253E	02	210	0.4028658E	02	211	0.5913438E
213	0.6740370E	02	214	0.5146042E	02	215	0.7808231E
217	-0.2538536E	02	218	-0.3872252E	02	219	-0.6130887E
221	-0.5014548E	02	222	-0.3099298E	02	223	-0.5285541E
225	-0.5625586E	01	226	0.1429443E	02	227	0.3526996E
229	0.6945285E	02	230	0.6290816E	02	231	0.2151120E
233	0.5039622E	01	234	-0.2635294E	01	235	-0.4881790E
237	-0.4423636E	02	238	0.8080788E	01	239	0.4849052E
241	0.2640791E	02	242	0.2348743E	02	243	0.5577518E
245	0.2708287E	02	246	-0.5043340E	02	247	-0.6134787E
249	-0.5156819E	02	250	-0.8617799E	02	251	-0.1051102E
253	0.1296006E	02	254	0.4864732E	02	255	0.2985533E
257	0.1602257E	02	258	0.2183092E	02	259	-0.1409816E
261	-0.9640254E	02	262	-0.8648790E	02	263	-0.6345183E
265	0.1073110E	02	266	0.9613621E	01	267	0.1935622E
269	0.1311593E	01	270	-0.3216304E	01	271	-0.3284656E
273	-0.8252081E	02	274	-0.8596878E	02	275	-0.6650803E
277	0.1226509E	00	278	-0.2143120E	00	279	-0.8768335E
281	-0.1773241E	02	282	0.1232602E	02	283	0.6528448E
285	0.6449174E	02	286	0.3472272E	02	287	0.2940793E
289	0.2295694E	02	290	0.3121742E	02	291	0.4961957E
293	0.3778027E	02	294	0.3326253E	02	295	0.4759514E
297	0.4093800E	02	298	0.3426826E	02	299	0.3685008E
301	0.2670468E	02	302	0.2484709E	02	303	0.2695171E
305	0.1817223E	02	306	0.2728761E	02	307	0.4015732E
309	0.2909839E	02	310	0.2693251E	02	311	0.2487907E
313	0.1773769E	02	314	0.2079736E	02	315	0.1909460E
317	0.1154197E	02	318	0.8712437E	01	319	0.2317287E
321	-0.5036366E	01	322	-0.3978153E	01	323	-0.3814483E
325	-0.2683926E	01	326	-0.3927184E	00	327	-0.1342151E
329	-0.1324914E	01	330	-0.8622472E	00	331	-0.1085973E
333	-0.8967004E	00	334	-0.4311240E	00	335	-0.5362754E
337	-0.7991541E	00	338	-0.7465789E	00	339	-0.5573049E
341	-0.6414266E	00	342	-0.5467889E	00	343	-0.3785470E
345	-0.6414266E	00	346	-0.6098811E	00	347	-0.4731833E
349	0.0		350	0.0		351	0.0
353	0.0		354	0.0		355	0.0
357	0.0		358	0.0		359	0.0
						204	-0.3977258E
						208	0.2105734E
						212	0.8511333E
						216	-0.1225698E
						220	-0.5596046E
						224	-0.4292113E
						228	0.4601495E
						232	0.1296273E
						236	-0.7407816E
						240	0.3822945E
						244	0.5807875E
						248	-0.4819794E
						252	-0.4236824E
						256	0.1026420E
						260	-0.5415216E
						264	-0.3649731E
						268	-0.8053242E
						272	-0.5961259E
						276	-0.3216785E
						280	-0.1766763E
						284	0.8264557E
						288	0.2099622E
						292	0.3962100E
						296	0.4192899E
						300	0.3540688E
						304	0.1829451E
						308	0.4266260E
						312	0.2294205E
						316	0.1812149E
						320	-0.1135175E
						324	-0.2429188E
						328	-0.1137094E
						332	-0.9387606E
						336	-0.7886394E
						340	-0.6519415E
						344	-0.3154557E
						348	-0.4206077E
						352	0.0
						356	0.0
						360	0.0

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TABLE A-15
ALGORITHM FOR ESTIMATING SIXTH COEFFICIENT OF NEXT SUNSPOT CYCLE FROM
PRECEDING MAGNETIC INDEX (AA)

$$\text{COEFFICIENT-6} = -16.07 + \left(\sum_I \text{SALG}(I) * \text{AA}(I) \right) / \sqrt{\sum_I \text{AA}^2(I)}$$

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I	SALG(I)	I	SALG(I)	I	SALG(I)	I	SALG(I)
1	-0.1065446E 02	2	-0.1321901E 02	3	-0.1628728E C2	4	-0.2405270E 02
5	-0.8851926E 01	6	-0.7100561E 01	7	-0.6906480E C1	8	-0.7322776E 01
9	-0.1629158E 02	10	-0.1271160E 02	11	-0.5654134E C1	12	-0.2005775E 02
13	-0.1057118E 02	14	-0.1124486E 02	15	0.1445794E C2	16	-0.1277739E 02
17	0.1302056E 02	18	0.4641994E 02	19	-0.8465432E C1	20	0.1995982E 02
21	0.2338516E 02	22	-0.9237920E 01	23	-0.1780113E C2	24	-0.1640819E 02
25	-0.1310516E 02	26	-0.1738861E 02	27	-0.1611726E C2	28	-0.2060773E 02
29	-0.1261363E 02	30	-0.1726506E 02	31	0.5269242E C1	32	0.1072944E 02
33	0.2945692E 02	34	0.3804343E 02	35	0.1502419E C2	36	0.1916150E 02
37	0.2075516E 02	38	0.8609422E 02	39	0.1897966E C2	40	0.2050502E 02
41	-0.1796368E 02	42	0.1659517E 02	43	-0.3083357E C1	44	0.3427550E 02
45	0.1485707E 03	46	0.2416617E 02	47	-0.2207143E C2	48	0.3461945E 02
49	0.3488304E 02	50	-0.4292227E 02	51	-0.1630013E C2	52	0.1997412E 01
53	0.5118682E 00	54	-0.2579454E 02	55	0.2375409E C2	56	-0.1078965E 02
57	0.2061017E 02	58	-0.9654017E 01	59	-0.2544035E C2	60	-0.1300161E 00
61	0.5977876E 01	62	0.2570213E 02	63	-0.3326341E C1	64	-0.6913249E 01
65	-0.1793251E 02	66	-0.9814082E 01	67	-0.1416786E C2	68	-0.1311411E 02
69	0.1671870E 02	70	0.3779637E 01	71	-0.2817271E C2	72	0.1669415E 02
73	-0.7781981E 01	74	-0.2331244E 02	75	0.2063162E C2	76	-0.3301068E 02
77	-0.9764171E 01	78	0.6240916E 01	79	0.9862513E C1	80	0.1138399E 02
81	-0.2677885E 00	82	0.3911042E 00	83	0.4249892E C1	84	0.3801514E 01
85	0.2366451E 02	86	0.1398695E 02	87	0.1469446E C2	88	-0.1033627E 02
89	0.1351183E 02	90	0.8348538E 01	91	0.1190689E C2	92	-0.4394026E 00
93	0.7498289E 01	94	-0.1897118E 02	95	0.1191196E C2	96	0.5704482E 01
97	-0.5269624E 01	98	0.1733522E 02	99	0.9572494E C1	100	-0.2712628E 02
101	-0.1406068E 02	102	0.4874931E 01	103	0.1147563E C2	104	-0.1647768E 02
105	-0.1204895E 01	106	-0.1213225E 02	107	-0.1000438E C2	108	-0.5335346E 01
109	-0.8767108E 00	110	-0.1726248E 01	111	0.1227123E C2	112	-0.5354586E 01
113	-0.1507595E 02	114	-0.2275829E 02	115	-0.1413245E C2	116	-0.2210234E 02
117	-0.5299258E 02	118	-0.4721379E 02	119	-0.4845872E C2	120	-0.3917624E 02
121	-0.1677390E 02	122	-0.2195053E 02	123	-0.8883356E C1	124	-0.2394542E 02
125	-0.7332185E 01	126	-0.3201965E 01	127	0.3568076E C1	128	0.3716336E 02
129	0.5158849E 02	130	0.3380983E 02	131	0.2684818E C2	132	0.2990773E 02
133	0.2455858E 02	134	0.1063436E 02	135	-0.2067049E C2	136	-0.1561658E 02
137	-0.1711301E 02	138	-0.2291356E C2	139	-0.7516413E C0	140	-0.1477383E 00
141	-0.1283587E 01	142	-0.9139171E 00	143	-0.9115111E C0	144	-0.1217697E 01
145	-0.2881840E 01	146	0.2024055E 00	147	-0.3952957E C1	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

TABLE A-16
EIGENVECTOR-1, H1(I)

$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

I	H1(I)	I	H1(I)	I	H1(I)	I	H1(I)
1	-0.3742549E-02	2	-0.4477695E-02	3	-0.7398307E-02	4	-0.6326705E-02
5	-0.6885130E-02	6	-0.6271146E-02	7	-0.8879576E-02	8	-0.1178890E-01
9	-0.1067635E-01	10	-0.1214376E-01	11	-0.9157173E-02	12	-0.1705713E-01
13	-0.2437655E-01	14	-0.3278535E-01	15	-0.3625479E-01	16	-0.3829953E-01
17	-0.4792264E-01	18	-0.5598808E-01	19	-0.6159779E-01	20	-0.6627685E-01
21	-0.7912695E-01	22	-0.9546274E-01	23	-0.1074703E 00	24	-0.1107067E 00
25	-0.1100281E 00	26	-0.1131818E 00	27	-0.1229105E 00	28	-0.1398896E 00
29	-0.1520092E 00	30	-0.1572870E 00	31	-0.1618854E 00	32	-0.1618840E 00
33	-0.1601457E 00	34	-0.1550015E 00	35	-0.1575859E 00	36	-0.1615044E 00
37	-0.1690357E 00	38	-0.1699324E 00	39	-0.1767514E 00	40	-0.1877146E 00
41	-0.1952917E 00	42	-0.1935282E 00	43	-0.1822407E 00	44	-0.1727332E 00
45	-0.1616540E 00	46	-0.1469241E 00	47	-0.1509016E 00	48	-0.1536998E 00
49	-0.1606615E 00	50	-0.1482306E 00	51	-0.1484691E 00	52	-0.1452706E 00
53	-0.1400504E 00	54	-0.1237200E 00	55	-0.1191099E 00	56	-0.1220933E 00
57	-0.1272029E 00	58	-0.1259198E 00	59	-0.1186133E 00	60	-0.1071745E 00
61	-0.1010374E 00	62	-0.9545261E-01	63	-0.1019766E 00	64	-0.9502250E-01
65	-0.1018888E 00	66	-0.9534431E-01	67	-0.8911723E-01	68	-0.8146745E-01
69	-0.7661039E-01	70	-0.7602435E-01	71	-0.6944060E-01	72	-0.6626201E-01
73	-0.5814830E-01	74	-0.4883035E-01	75	-0.4357237E-01	76	-0.3989045E-01
77	-0.3663144E-01	78	-0.2506368E-01	79	-0.1868648E-01	80	-0.1616783E-01
81	-0.1456582E-01	82	-0.1157545E-01	83	-0.9086795E-02	84	-0.1529552E-01
85	-0.2661291E-01	86	-0.3114060E-01	87	-0.2813635E-01	88	-0.2615363E-01
89	-0.1404397E-01	90	-0.8582860E-02	91	-0.2755349E-02	92	-0.5087048E-02
93	-0.6803006E-02	94	-0.1457335E-01	95	-0.1577853E-01	96	-0.1750681E-01
97	-0.1650577E-01	98	-0.9638816E-02	99	-0.9852000E-02	100	-0.7460773E-02
101	-0.7281553E-02	102	-0.2742852E-02	103	-0.4144017E-02	104	-0.5651873E-02
105	-0.3388700E-02	106	-0.8828368E-02	107	-0.9240713E-02	108	-0.7143717E-02
109	-0.7426627E-02	110	-0.7032406E-02	111	-0.8679006E-02	112	-0.7045574E-02
113	-0.1045017E-01	114	-0.9516090E-02	115	-0.4487596E-02	116	-0.2426639E-02
117	-0.1059774E-02	118	-0.1386527E-02	119	-0.1218781E-02	120	-0.3829063E-03
121	-0.9967221E-03	122	-0.3566821E-04	123	-0.2837209E-03	124	-0.2396130E-02
125	-0.5679023E-02	126	-0.3841466E-02	127	-0.4632045E-02	128	-0.3795808E-02
129	-0.4023712E-02	130	-0.3218258E-02	131	-0.1499601E-02	132	-0.1737026E-02
133	-0.8539858E-03	134	-0.1258873E-02	135	-0.3087688E-03	136	-0.1869761E-02
137	-0.4399054E-02	138	-0.5094774E-02	139	-0.3419608E-02	140	-0.1887157E-02
141	-0.1817544E-02	142	-0.3580849E-02	143	-0.3527115E-02	144	-0.2018614E-02
145	-0.2307407E-02	146	-0.1831131E-02	147	-0.2979360E-02	148	-0.2002199E-02
149	-0.2492558E-02	150	-0.1622141E-02	151	-0.1769009E-02	152	-0.1492058E-02
153	-0.1412929E-02	154	-0.8110702E-03	155	-0.1008892E-02	156	-0.1483665E-02
157	-0.1503447E-02	158	-0.1404536E-02	159	-0.1048457E-02	160	-0.1226497E-02
161	-0.1206714E-02	162	-0.1028674E-02	163	-0.7121591E-03	164	-0.5934660E-03
165	-0.1206714E-02	166	-0.1147368E-02	167	-0.8901991E-03	168	-0.7912880E-04
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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TABLE A-17
EIGENVECTOR-2, H2(I)

$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

I	H2(I)	I	H2(I)	I	H2(I)	I	H2(I)
1	0.4038248E-02	2	0.3947161E-02	3	0.1790713E-02	4	0.1638229E-02
5	-0.7383183E-02	6	-0.1327292E-01	7	-0.1641878E-01	8	-0.2511825E-01
9	-0.2387143E-01	10	-0.2717640E-01	11	-0.1365194E-01	12	-0.2613906E-01
13	-0.2676429E-01	14	-0.4743040E-01	15	-0.5402483E-01	16	-0.6932849E-01
17	-0.6997645E-01	18	-0.7282126E-01	19	-0.8251435E-01	20	-0.9141791E-01
21	-0.8376098E-01	22	-0.8689982E-01	23	-0.8842695E-01	24	-0.1127622E 00
25	-0.1124943E 00	26	-0.1094490E 00	27	-0.9264725E-01	28	-0.9246856E-01
29	-0.9680563E-01	30	-0.8143032E-01	31	-0.5170874E-01	32	-0.6770772E-01
33	-0.1243539E 00	34	-0.1648461E 00	35	-0.1356757E 00	36	-0.8110744E-01
37	-0.5919748E-01	38	-0.7436252E-01	39	-0.9259045E-01	40	-0.6777692E-01
41	-0.3178229E-01	42	0.6097776E-03	43	-0.4291143E-02	44	-0.1063517E-01
45	-0.5551912E-02	46	0.9404462E-02	47	0.2181303E-01	48	0.5153660E-01
49	0.7063234E-01	50	0.8046508E-01	51	0.6607544E-01	52	0.6467491E-01
53	0.7388628E-01	54	0.8691573E-01	55	0.7732552E-01	56	0.8404624E-01
57	0.8152986E-01	58	0.9437877E-01	59	0.9464878E-01	60	0.1040729E 00
61	0.1021495E 00	62	0.1025903E 00	63	0.1137832E 00	64	0.1110876E 00
65	0.9062827E-01	66	0.6927246E-01	67	0.8106351E-01	68	0.1136829E 00
69	0.9725136E-01	70	0.8011276E-01	71	0.6343192E-01	72	0.8496326E-01
73	0.9789801E-01	74	0.1235582E 00	75	0.1142467E 00	76	0.1122541E 00
77	0.9009588E-01	78	0.9799868E-01	79	0.8372933E-01	80	0.6845200E-01
81	0.6873548E-01	82	0.7721663E-01	83	0.1081835E 00	84	0.1067646E 00
85	0.1126890E 00	86	0.7947242E-01	87	0.8298147E-01	88	0.8935207E-01
89	0.1184978E 00	90	0.1201892E 00	91	0.1219676E 00	92	0.1113154E 00
93	0.1119944E 00	94	0.1005043E 00	95	0.1011828E 00	96	0.1010374E 00
97	0.1064029E 00	98	0.1126279E 00	99	0.1128459E 00	100	0.1178452E 00
101	0.1159326E 00	102	0.1132662E 00	103	0.1137061E 00	104	0.1129802E 00
105	0.1177548E 00	106	0.1149834E 00	107	0.1074562E 00	108	0.1054337E 00
109	0.1064841E 00	110	0.1066018E 00	111	0.1041136E 00	112	0.9077775E-01
113	0.9610623E-01	114	0.9723073E-01	115	0.1048095E 00	116	0.9830552E-01
117	0.9867877E-01	118	0.9643102E-01	119	0.1023523E 00	120	0.9859473E-01
121	0.9627026E-01	122	0.8532828E-01	123	0.7476377E-01	124	0.6131546E-01
125	0.5853450E-01	126	0.6054566E-01	127	0.6113087E-01	128	0.5334346E-01
129	0.4720709E-01	130	0.4810040E-01	131	0.4637574E-01	132	0.5318213E-01
133	0.4450073E-01	134	0.4347057E-01	135	0.3652705E-01	136	0.3415742E-01
137	0.2845884E-01	138	0.2469104E-01	139	0.2462280E-01	140	0.2525666E-01
141	0.2320783E-01	142	0.2179125E-01	143	0.1711592E-01	144	0.7974997E-02
145	0.6966017E-02	146	0.3615164E-02	147	0.6814592E-02	148	0.4839145E-02
149	0.5923770E-02	150	0.3855153E-02	151	0.4365701E-02	152	0.3707508E-02
153	0.3519452E-02	154	0.1927576E-02	155	0.2397717E-02	156	0.3526055E-02
157	0.3573068E-02	158	0.3337998E-02	159	0.2491745E-02	160	0.2914872E-02
161	0.2867857E-02	162	0.2444731E-02	163	0.1692506E-02	164	0.1410422E-02
165	0.2867857E-02	166	0.2726815E-02	167	0.2115633E-02	168	0.1880562E-03
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

TABLE A-18
EIGENVECTOR-3, H3(I)

$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

I	H3(I)	I	H3(I)	I	H3(I)	I	H3(I)
1	0.2069906E-01	2	0.1874134E-01	3	0.1220497E-01	4	0.1265178E-01
5	0.2471877E-01	6	0.3185517E-01	7	0.2747503E-01	8	0.1323728E-01
9	-0.4692961E-02	10	0.1276214E-03	11	-0.2122602E-01	12	0.9410322E-02
13	0.8869555E-02	14	0.2259617E-01	15	0.7591128E-02	16	0.1341683E-01
17	0.4529838E-01	18	0.3995033E-01	19	0.2526908E-01	20	0.2200051E-01
21	0.1011348E-01	22	0.2807155E-01	23	0.3034124E-01	24	0.8096987E-01
25	0.7884979E-01	26	0.6869733E-01	27	0.6655711E-01	28	0.7652277E-01
29	0.9210128E-01	30	0.1029646E 00	31	0.1360773E 00	32	0.1857687E 00
33	0.2393370E 00	34	0.2559727E 00	35	0.2119859E 00	36	0.8843243E-01
37	0.2183436E-03	38	-0.4426071E-01	39	-0.1132816E-01	40	-0.6915886E-02
41	-0.1931386E-01	42	0.3721466E-02	43	-0.1916531E-01	44	0.5921833E-02
45	0.2081404E-01	46	0.2723851E-01	47	-0.7345110E-02	48	-0.8015198E-01
49	-0.9451669E-01	50	-0.1292019E 00	51	-0.1879660E 00	52	-0.2299986E 00
53	-0.2262921E 00	54	-0.1393093E 00	55	-0.1064546E 00	56	-0.6933123E-01
57	-0.7635939E-01	58	-0.6457311E-01	59	-0.8809125E-01	60	-0.1003346E 00
61	-0.1053047E 00	62	-0.1197432E 00	63	-0.1670032E 00	64	-0.1618615E 00
65	-0.8857089E-01	66	-0.3350975E-01	67	-0.1171833E-01	68	-0.2404491E-02
69	0.2313159E-01	70	0.5329716E-01	71	0.4567437E-01	72	0.9420376E-02
73	-0.2890771E-01	74	-0.6438476E-01	75	-0.6092141E-01	76	-0.2341576E-01
77	0.4107636E-01	78	0.7817519E-01	79	0.8122540E-01	80	0.4363925E-01
81	0.2843563E-01	82	0.4223157E-02	83	0.3023060E-01	84	0.1314710E-01
85	0.3013526E-01	86	-0.5854007E-02	87	0.3514275E-01	88	0.3960221E-01
89	0.5834632E-01	90	0.6236419E-01	91	0.6050998E-01	92	0.8003670E-01
93	0.7046354E-01	94	0.9974623E-01	95	0.9899020E-01	96	0.1175315E 00
97	0.9774888E-01	98	0.9221774E-01	99	0.4690538E-01	100	0.6113281E-01
101	0.6030202E-01	102	0.1141341E 00	103	0.1341275E 00	104	0.1669239E 00
105	0.1547943E 00	106	0.1118286E 00	107	0.7548708E-01	108	0.5399956E-01
109	0.7884741E-01	110	0.7219487E-01	111	0.6196903E-01	112	0.5167305E-01
113	0.6600982E-01	114	0.8143026E-01	115	0.6765723E-01	116	0.7805043E-01
117	0.8295298E-01	118	0.8471066E-01	119	0.9612381E-01	120	0.9109831E-01
121	0.9960771E-01	122	0.9345114E-01	123	0.8363986E-01	124	0.6563598E-01
125	0.6488687E-01	126	0.7086158E-01	127	0.7338780E-01	128	0.5687401E-01
129	0.3813777E-01	130	0.4315059E-01	131	0.5522485E-01	132	0.7735181E-01
133	0.6670511E-01	134	0.5444049E-01	135	0.3842628E-01	136	0.3530065E-01
137	0.3436894E-01	138	0.3035448E-01	139	0.4313194E-01	140	0.4948937E-01
141	0.5290008E-01	142	0.5193739E-01	143	0.4571639E-01	144	0.3206313E-01
145	0.3048441E-01	146	0.1947791E-01	147	0.2547230E-01	148	0.1666457E-01
149	0.2033949E-01	150	0.1323681E-01	151	0.1508817E-01	152	0.1282823E-01
153	0.1218253E-01	154	0.6618403E-02	155	0.8232646E-02	156	0.1210684E-01
157	0.1226826E-01	158	0.1146113E-01	159	0.8555494E-02	160	0.1000832E-01
161	0.9846892E-02	162	0.8394070E-02	163	0.5811278E-02	164	0.4842732E-02
165	0.9846892E-02	166	0.9362619E-02	167	0.7264100E-02	168	0.6456978E-03
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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TABLE A-19
EIGENVECTOR-4, H4(I)

$$SS(I) = SSB(I) + \sum_{K=1}^6 (CDEF-K) * HK(I)$$

I	H4(I)	I	H4(I)	I	H4(I)	I	H4(I)
1	0.1870900E-01	2	0.2326918E-01	3	0.3294444E-01	4	0.3744870E-01
5	0.3945745E-01	6	0.3745852E-01	7	0.5995065E-01	8	0.6060554E-01
9	0.4249351E-01	10	0.3149310E-01	11	0.3429331E-01	12	0.6977600E-01
13	0.7120192E-01	14	0.5951800E-01	15	0.5026831E-01	16	0.4801455E-01
17	0.1057352E 00	18	0.1442322E 00	19	0.1815125E 00	20	0.1507484E 00
21	0.1145465E 00	22	0.7899201E-01	23	0.4963030E-01	24	0.4944986E-01
25	0.3914326E-01	26	0.6167901E-01	27	0.7490581E-01	28	0.2243431E-01
29	-0.4294384E-01	30	-0.3822196E-01	31	0.1161683E-03	32	0.1026156E 00
33	0.1183832E 00	34	0.1446922E 00	35	0.7236332E-01	36	0.8491099E-01
37	0.5188193E-02	38	-0.4334576E-01	39	-0.1518920E 00	40	-0.1604742E 00
41	-0.2038403E 00	42	-0.2192374E 00	43	-0.2777584E 00	44	-0.2449171E 00
45	-0.2441133E 00	46	-0.2165582E 00	47	-0.1112191E 00	48	0.4738448E-01
49	0.2338020E 00	50	0.2132708E 00	51	0.9381163E-01	52	0.3926852E-01
53	0.4147815E-01	54	0.3963363E-01	55	0.1543330E-01	56	-0.3901786E-01
57	0.2602573E-01	58	0.4891764E-01	59	0.1145229E 00	60	0.4122010E-01
61	-0.6900299E-03	62	-0.6472155E-02	63	0.7914484E-01	64	0.1763021E 00
65	0.1982914E 00	66	0.1218080E 00	67	0.8872248E-02	68	-0.9670156E-01
69	-0.1052569E 00	70	-0.1139593E 00	71	-0.8338475E-01	72	-0.3372075E-01
73	-0.3072941E-02	74	0.3086577E-01	75	0.2553492E-01	76	0.1662101E-01
77	0.3912466E-01	78	0.1671990E-01	79	-0.3840624E-01	80	-0.6511992E-01
81	-0.9029013E-01	82	-0.7207900E-01	83	-0.9871161E-01	84	-0.4895350E-01
85	0.6965056E-02	86	0.4495374E-01	87	0.2976642E-01	88	0.3605456E-01
89	0.7550919E-01	90	0.5828713E-01	91	0.1623960E-02	92	-0.5500667E-01
93	-0.7202715E-01	94	-0.8313590E-01	95	-0.9255213E-01	96	-0.5291431E-01
97	0.1232600E-01	98	0.2615225E-01	99	0.2932620E-01	100	0.2846737E-01
101	0.2113073E-01	102	0.3911201E-01	103	0.7065183E-01	104	0.1047770E 00
105	0.8156842E-01	106	0.3413849E-01	107	0.1286474E-01	108	-0.4361838E-02
109	0.2086492E-01	110	0.2586488E-01	111	0.4948321E-01	112	0.2791185E-01
113	0.1792976E-01	114	0.3759109E-02	115	0.1326507E-01	116	0.1026516E-01
117	0.9342406E-02	118	0.3207376E-02	119	0.1701976E-01	120	0.1054804E-01
121	0.4014105E-02	122	-0.6475408E-02	123	0.6488726E-02	124	-0.1396375E-01
125	-0.2116734E-01	126	-0.2125929E-01	127	-0.1226754E-02	128	0.1186315E-01
129	0.1858114E-01	130	0.1380921E-01	131	0.1533154E-01	132	0.1420701E-01
133	0.1350477E-01	134	0.2000989E-01	135	0.2308528E-01	136	0.2321241E-01
137	0.1531198E-01	138	0.1527323E-01	139	0.6550159E-02	140	0.1300575E-02
141	-0.1047507E-01	142	-0.1499629E-01	143	-0.1349429E-01	144	-0.1355606E-01
145	-0.1255519E-01	146	-0.7796679E-02	147	-0.7958792E-02	148	-0.5140647E-02
149	-0.6222516E-02	150	-0.4049573E-02	151	-0.4700784E-02	152	-0.4009392E-02
153	-0.3811854E-02	154	-0.2024787E-02	155	-0.2518638E-02	156	-0.3703880E-02
157	-0.3753264E-02	158	-0.3506339E-02	159	-0.2617408E-02	160	-0.3061874E-02
161	-0.3012488E-02	162	-0.2568023E-02	163	-0.1777862E-02	164	-0.1481552E-02
165	-0.3012488E-02	166	-0.2864333E-02	167	-0.2222328E-02	168	-0.1975402E-03
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

TABLE A-20
EIGENVECTOR-5, H5(I)

$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

I	H5(I)	I	H5(I)	I	H5(I)	I	H5(I)
1	0.5712051E-02	2	0.3687665E-02	3	0.5485062E-02	4	0.3194942E-03
5	0.9336568E-02	6	0.2414548E-01	7	0.6257421E-01	8	0.9092832E-01
9	0.9455383E-01	10	0.8472729E-01	11	0.9255332E-01	12	0.9299171E-01
13	0.9710735E-01	14	0.8939874E-01	15	0.8305115E-01	16	0.6542689E-01
17	0.9517384E-01	18	0.8896041E-01	19	0.6721628E-01	20	-0.2771600E-01
21	-0.5401974E-01	22	-0.4982772E-01	23	-0.2684005E-01	24	-0.3304606E-01
25	-0.7842314E-01	26	-0.6956857E-01	27	-0.9344548E-01	28	-0.8701313E-01
29	-0.1084905E 00	30	-0.8015442E-01	31	-0.6457624E-01	32	-0.5586009E-01
33	-0.3432123E-01	34	-0.2803462E-01	35	-0.1865198E-01	36	0.2963957E-01
37	0.6207583E-01	38	0.1395134E 00	39	0.2288256E 00	40	0.3091782E 00
41	0.2574534E 00	42	0.1165662E 00	43	0.5444278E-01	44	-0.2623152E-01
45	-0.1136047E 00	46	-0.2025578E 00	47	-0.1398714E 00	48	-0.2759159E-01
49	0.6161799E-01	50	0.2011151E-01	51	-0.4527529E-01	52	-0.1092143E 00
53	-0.8166355E-01	54	-0.1414548E 00	55	-0.2187662E 00	56	-0.3147960E 00
57	-0.1625105E 00	58	0.1385138E-01	59	0.1771166E 00	60	0.8284765E-01
61	-0.3963560E-01	62	-0.8162785E-01	63	-0.5839939E-01	64	0.4032296E-01
65	0.7388175E-01	66	0.1439621E 00	67	0.1223024E 00	68	0.6656182E-01
69	0.5608507E-02	70	-0.6655484E-01	71	-0.1651857E-01	72	-0.8970569E-03
73	0.8696143E-02	74	0.4641730E-02	75	0.1043226E-01	76	0.9469315E-02
77	0.1841152E-02	78	0.2422907E-02	79	0.1384616E-01	80	0.1914378E-01
81	-0.1470904E-02	82	0.1694428E-01	83	0.6866413E-01	84	0.1285295E 00
85	0.1336866E 00	86	0.8238363E-01	87	0.5594843E-01	88	0.8204299E-01
89	0.1007848E 00	90	0.1377392E 00	91	0.1649162E 00	92	0.1721998E 00
93	0.1192511E 00	94	0.5459330E-01	95	-0.1158602E-02	96	-0.2406823E-01
97	-0.5081124E-01	98	-0.3975853E-01	99	-0.5432252E-02	100	0.1060409E-01
101	0.7963415E-02	102	-0.1722323E-01	103	-0.1181616E-01	104	-0.2785200E-02
105	-0.5204607E-02	106	-0.4433398E-01	107	-0.3467415E-01	108	-0.3339040E-01
109	-0.1129723E-02	110	-0.2095157E-01	111	-0.2552095E-01	112	-0.2917869E-01
113	-0.3585856E-01	114	-0.3894512E-01	115	-0.4626591E-01	116	-0.4472815E-01
117	-0.4387893E-01	118	-0.3029469E-01	119	-0.3177045E-01	120	-0.2333652E-01
121	-0.4022099E-01	122	-0.3447092E-01	123	-0.3518674E-01	124	-0.2241329E-01
125	-0.1196373E-01	126	-0.2158993E-01	127	-0.1769510E-01	128	-0.8452214E-02
129	0.3000952E-02	130	0.6723501E-02	131	0.6104469E-02	132	-0.1428898E-02
133	-0.8659568E-02	134	-0.7821590E-02	135	-0.6586459E-02	136	-0.7425740E-02
137	-0.5322631E-02	138	-0.3076396E-02	139	-0.5215727E-02	140	-0.6551512E-02
141	-0.5667429E-02	142	-0.4105575E-02	143	-0.2090521E-02	144	-0.2668272E-02
145	-0.1731044E-02	146	-0.3135547E-02	147	-0.3811808E-03	148	0.4837106E-03
149	0.5824931E-03	150	0.3790827E-03	151	0.4450267E-03	152	0.3803051E-03
153	0.3618132E-03	154	0.1895414E-03	155	0.2357710E-03	156	0.3467221E-03
157	0.3513449E-03	158	0.3282302E-03	159	0.2450168E-03	160	0.2866236E-03
161	0.2820005E-03	162	0.2403940E-03	163	0.1664266E-03	164	0.1386888E-03
165	0.2820005E-03	166	0.2681317E-03	167	0.2080333E-03	168	0.1849183E-04
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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TABLE A-21
EIGENVECTOR-6, H6(I)
$$SS(I) = SSB(I) + \sum_{K=1}^6 (COEF-K) * HK(I)$$

I	H6(I)	I	H6(I)	I	H6(I)	I	H6(I)
1	0.1821372E-01	2	0.2561758E-01	3	0.1222468E-01	4	0.8606512E-02
5	-0.6361451E-02	6	0.1865594E-01	7	0.7545780E-02	8	0.7009443E-02
9	-0.6312035E-02	10	0.2538527E-01	11	0.4614539E-01	12	0.3341249E-01
13	0.3774741E-01	14	0.4648691E-01	15	0.1059665E 00	16	0.1313007E 00
17	0.1054345E 00	18	0.8077997E-01	19	0.9135610E-01	20	0.1061926E 00
21	0.4375413E-01	22	0.2279311E-01	23	0.5798196E-01	24	0.4174399E-01
25	0.2096493E-01	26	-0.5189345E-01	27	-0.3100522E-01	28	-0.2954743E-01
29	0.3763994E-01	30	0.4553489E-01	31	0.2837938E-01	32	-0.3870258E-01
33	-0.1043205E 00	34	-0.1555123E 00	35	-0.1608403E 00	36	-0.1481323E 00
37	-0.1284159E 00	38	-0.8846760E-01	39	0.8261416E-02	40	0.1102639E 00
41	0.1275381E 00	42	0.1317789E 00	43	0.8954781E-01	44	0.5433317E-01
45	0.4953589E-01	46	0.2170878E-01	47	-0.1608394E-01	48	-0.3176010E-01
49	0.1613458E-01	50	0.1191878E 00	51	0.1283411E 00	52	0.1602291E 00
53	0.1017250E 00	54	0.8556050E-01	55	-0.4215062E-01	56	-0.1201264E 00
57	-0.1996442E 00	58	-0.1227109E 00	59	-0.2320381E-01	60	0.1675361E-01
61	-0.4778751E-01	62	-0.5744875E-01	63	0.2653033E-02	64	0.5491195E-01
65	0.7464671E-01	66	0.5840010E-01	67	0.7042104E-01	68	0.3795824E-01
69	0.3038172E-01	70	-0.7988393E-01	71	-0.1434490E 00	72	-0.1729642E 00
73	-0.1266268E 00	74	-0.9818238E-01	75	-0.1005450E 00	76	-0.8089697E-01
77	-0.7117927E-01	78	-0.2659642E-01	79	-0.3881211E-01	80	-0.2818974E-01
81	-0.9280419E-01	82	-0.9047705E-01	83	-0.1561800E 00	84	-0.1525650E 00
85	-0.2090923E 00	86	-0.1608100E 00	87	-0.1518711E 00	88	-0.1204574E 00
89	-0.1103919E 00	90	-0.7295966E-01	91	-0.5201469E-01	92	-0.4670295E-01
93	-0.7415585E-02	94	0.6586003E-01	95	0.7715690E-01	96	0.7005101E-01
97	0.1431148E-01	98	-0.1363068E-02	99	-0.4862270E-01	100	-0.4961262E-01
101	-0.3724009E-01	102	-0.1332548E-01	103	0.1783147E-01	104	0.2589560E-01
105	0.1980227E-01	106	0.1288397E-01	107	0.1438008E-01	108	0.2838467E-01
109	0.4074485E-01	110	0.5463744E-01	111	0.5009289E-01	112	0.5165996E-01
113	0.3576225E-01	114	0.6263119E-01	115	0.7549751E-01	116	0.9788656E-01
117	0.9289461E-01	118	0.8209884E-01	119	0.1059796E 00	120	0.1160352E 00
121	0.1388794E 00	122	0.1190014E 00	123	0.9447700E-01	124	0.7233274E-01
125	0.9329677E-01	126	0.1197535E 00	127	0.1251547E 00	128	0.1128078E 00
129	0.7005662E-01	130	0.5068263E-01	131	0.3830823E-01	132	0.4279143E-01
133	0.5812979E-01	134	0.7230955E-01	135	0.8005416E-01	136	0.8744913E-01
137	0.6737357E-01	138	0.6283981E-01	139	0.6383008E-01	140	0.6569040E-01
141	0.5975898E-01	142	0.6597114E-01	143	0.5669644E-01	144	0.5837119E-01
145	0.4755508E-01	146	0.3541012E-01	147	0.3422744E-01	148	0.2059291E-01
149	0.2513529E-01	150	0.1635789E-01	151	0.1864386E-01	152	0.1585105E-01
153	0.1505310E-01	154	0.8178942E-02	155	0.1017381E-01	156	0.1496148E-01
157	0.1516097E-01	158	0.1416354E-01	159	0.1057278E-01	160	0.1236816E-01
161	0.1216867E-01	162	0.1037329E-01	163	0.7181510E-02	164	0.5984593E-02
165	0.1216867E-01	166	0.1157021E-01	167	0.8976892E-02	168	0.797945E-03
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

TABLE A-22 EXAMPLE DATA VECTOR,
AA(I), FOR CALCULATING COEF-1 FROM TABLE A-5 FOR CYCLE N=21

$$\text{COEF-1} = -120.37 + \left(\sum_I \text{SALG}(I) * \text{AA}(I) \right) / \sqrt{\sum_I \text{AA}^2(I)}$$

$$\sqrt{\sum_I \text{AA}^2(I)} = 275.412, \quad \text{COEF-1} = -31.58$$

I	AA(I)	I	AA(I)	I	AA(I)	I	AA(I)
1	0.1820000E 02	2	0.1689999E 02	3	0.1380000E 02	4	0.1030000E 02
5	0.1180000E 02	6	0.1629999E 02	7	0.1430000E 02	8	0.1260000E 02
9	0.1050000E 02	10	0.1570000E 02	11	0.1480000E 02	12	0.1679999E 02
13	0.1750000E 02	14	0.1310000E 02	15	0.1170000E 02	16	0.1380000E 02
17	0.1420000E 02	18	0.1480000E 02	19	0.1859999E 02	20	0.1200000E 02
21	0.1480000E 02	22	0.1250000E 02	23	0.1709999E 02	24	0.2000000E 02
25	0.2939999E 02	26	0.1750000E 02	27	0.1679999E 02	28	0.2050000E 02
29	0.1889999E 02	30	0.1979999E 02	31	0.1380000E 02	32	0.1550000E 02
33	0.3309999E 02	34	0.1859999E 02	35	0.1440000E 02	36	0.1750000E 02
37	0.2470000E 02	38	0.1779999E 02	39	0.1889999E 02	40	0.2450000E 02
41	0.2120000E 02	42	0.2659999E 02	43	0.2339999E 02	44	0.2229999E 02
45	0.2139999E 02	46	0.2489999E 02	47	0.1800000E 02	48	0.2020000E 02
49	0.2209999E 02	50	0.2479999E 02	51	0.2620000E 02	52	0.2039999E 02
53	0.1759999E 02	54	0.2579999E 02	55	0.2779999E 02	56	0.2379999E 02
57	0.2620000E 02	58	0.1889999E 02	59	0.1600000E 02	60	0.1700000E 02
61	0.2489999E 02	62	0.1809999E 02	63	0.1970000E 02	64	0.1460000E 02
65	0.1639999E 02	66	0.1410000E 02	67	0.2789999E 02	68	0.2379999E 02
69	0.1800000E 02	70	0.2039999E 02	71	0.2989999E 02	72	0.2229999E 02
73	0.2129999E 02	74	0.2300000E 02	75	0.2179999E 02	76	0.1670000E 02
77	0.2320000E 02	78	0.2079999E 02	79	0.2070000E 02	80	0.2379999E 02
81	0.2150000E 02	82	0.1839999E 02	83	0.1670000E 02	84	0.1800000E 02
85	0.2229999E 02	86	0.2479999E 02	87	0.2159999E 02	88	0.2129999E 02
89	0.2500000E 02	90	0.2179999E 02	91	0.2389999E 02	92	0.2079999E 02
93	0.1939999E 02	94	0.2370000E 02	95	0.1540000E 02	96	0.3529999E 02
97	0.2289999E 02	98	0.2300000E 02	99	0.2459999E 02	100	0.2070000E 02
101	0.2900000E 02	102	0.3479999E 02	103	0.3900000E 02	104	0.4150000E 02
105	0.2829999E 02	106	0.3020000E 02	107	0.2400000E 02	108	0.2279999E 02
109	0.2600000E 02	110	0.3129999E 02	111	0.2279999E 02	112	0.2200000E 02
113	0.2789999E 02	114	0.2870000E 02	115	0.3650000E 02	116	0.3579999E 02
117	0.3179999E 02	118	0.3189999E 02	119	0.3570000E 02	120	0.3420000E 02
121	0.3750000E 02	122	0.3979999E 02	123	0.2979999E 02	124	0.2959999E 02
125	0.2979999E 02	126	0.3320000E 02	127	0.3429999E 02	128	0.2679999E 02
129	0.2479999E 02	130	0.2289999E 02	131	0.2439999E 02	132	0.2020000E 02
133	0.1870000E 02	134	0.2150000E 02	135	0.3139999E 02	136	0.2320000E 02
137	0.2600000E 02	138	0.3200000E 02	139	0.0	140	0.0
141	0.0	142	0.0	143	0.0	144	0.0
145	0.0	146	0.0	147	0.0	148	0.0
149	0.0	150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0	156	0.0
157	0.0	158	0.0	159	0.0	160	0.0
161	0.0	162	0.0	163	0.0	164	0.0
165	0.0	166	0.0	167	0.0	168	0.0
169	0.0	170	0.0	171	0.0	172	0.0
173	0.0	174	0.0	175	0.0	176	0.0
177	0.0	178	0.0	179	0.0	180	0.0

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APPINDIX B

COMPARISON OF ESTIMATED AND ACTUAL SUNSPOT CYCLES

This appendix provides a comparison of the actual sunspot cycles with those predicted using the ADAPT developed techniques. The estimates are derived using both the maximum history and the modern biased philosophies. The maximum history estimates are designated by the symbol "O" and the modern biased by the symbol "□" on all figures in this appendix.

In all cases, the estimates were made using the "one out" method of independent testing. That is, the estimate for each cycle was made using a new set of prediction algorithms derived from all cycles in the set of cycles 3 through 20 with the exception of the cycle being estimated. Thus, cycles occurring both before and after the cycle were used as training data.

Results are presented for predictions using only the sunspots as predictors and for using both the AA-magnetic index and the sunspots. Since the AA-index is only available starting in the 1860's, this latter set of predictions is only available beginning with Cycle 12. Also note that the entire set of cycles available for the "one-out" testing is Cycles 12-20 for the magnetic plus sunspot predictor.

The conclusion reached from these comparisons are discussed in the body of the report.

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FIGURE - B1

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 3 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JUNE 1775

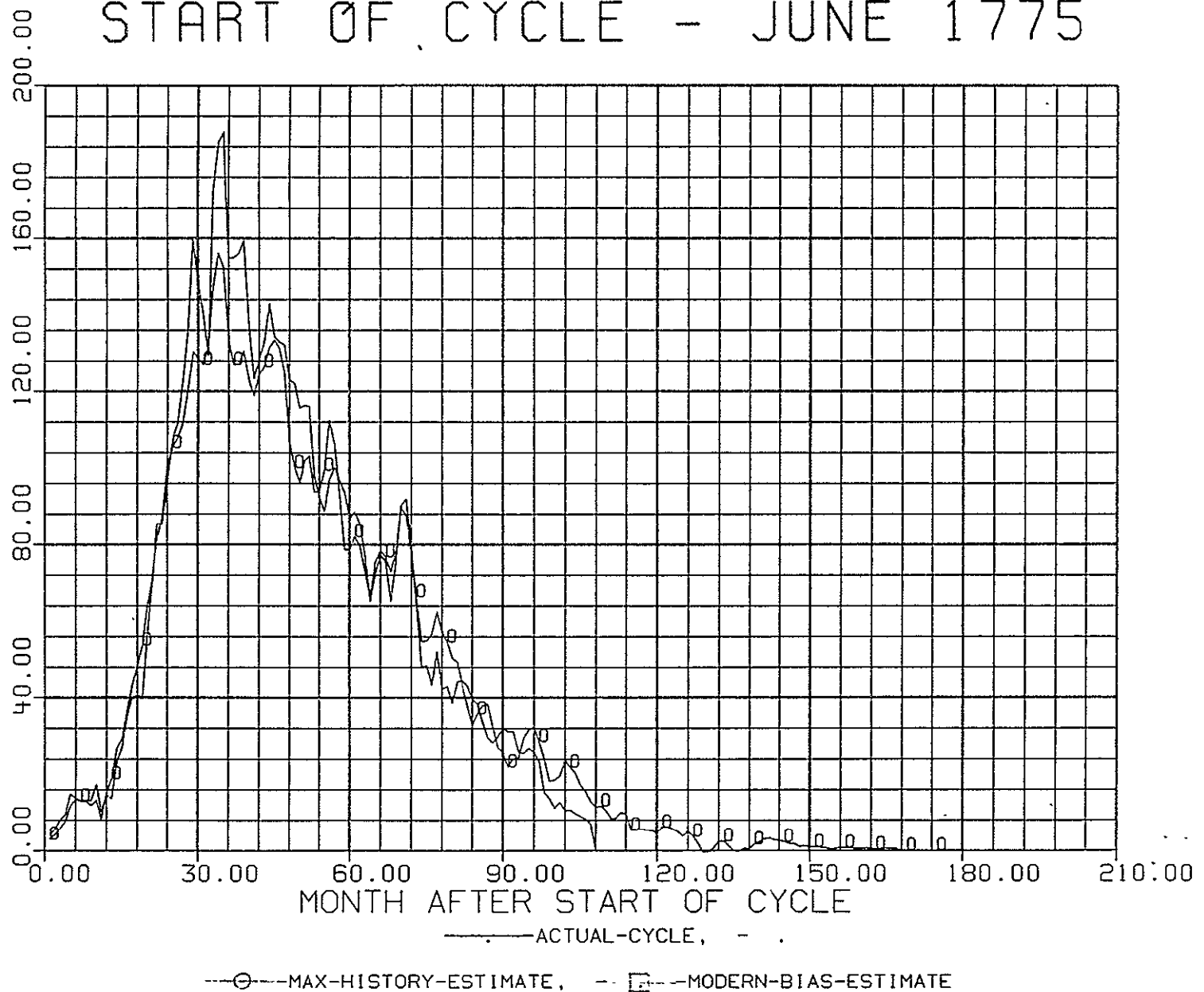


FIGURE - B2

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 4 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - SEPTEMBER 1784

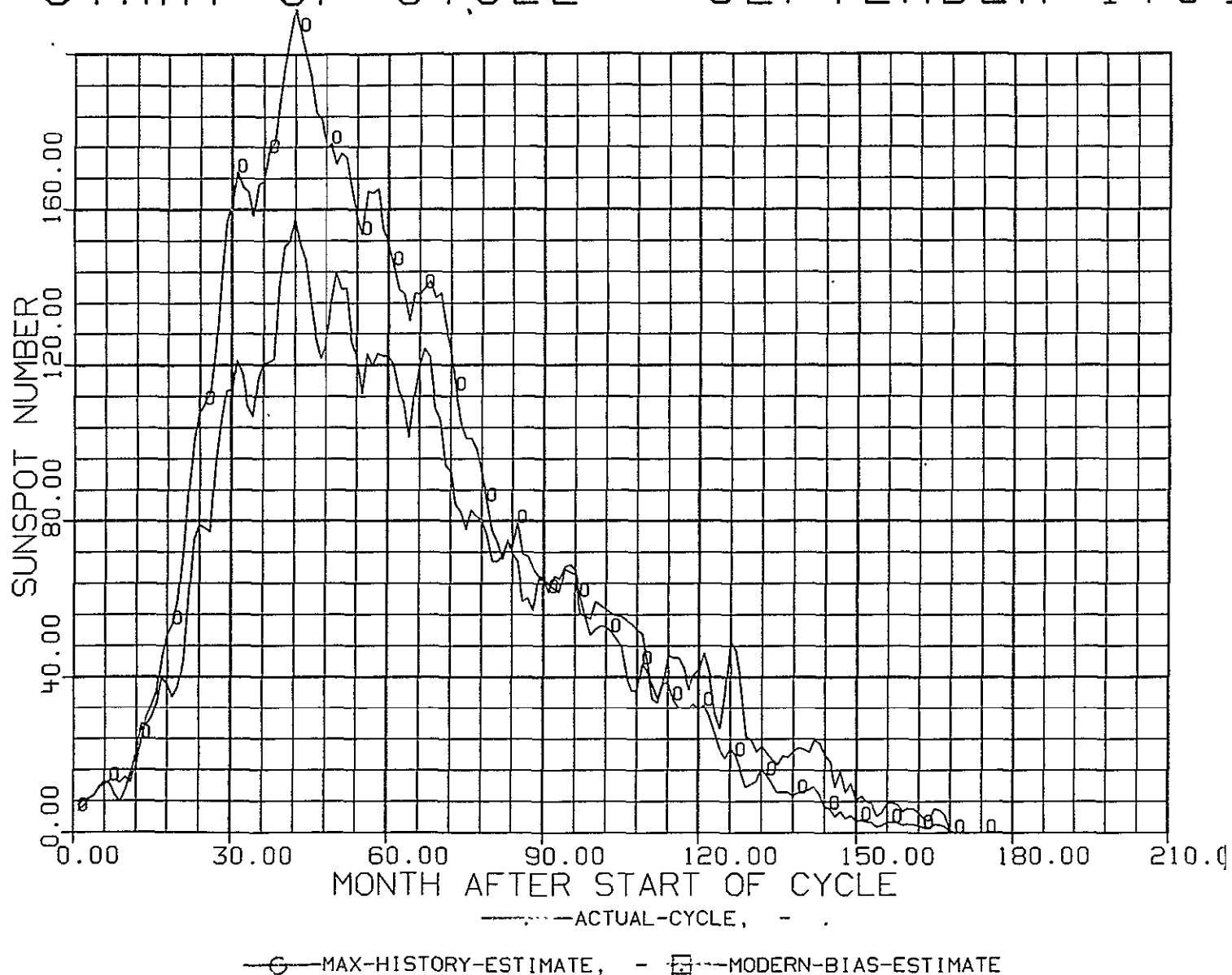


FIGURE - B3

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 5 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - APRIL 1798

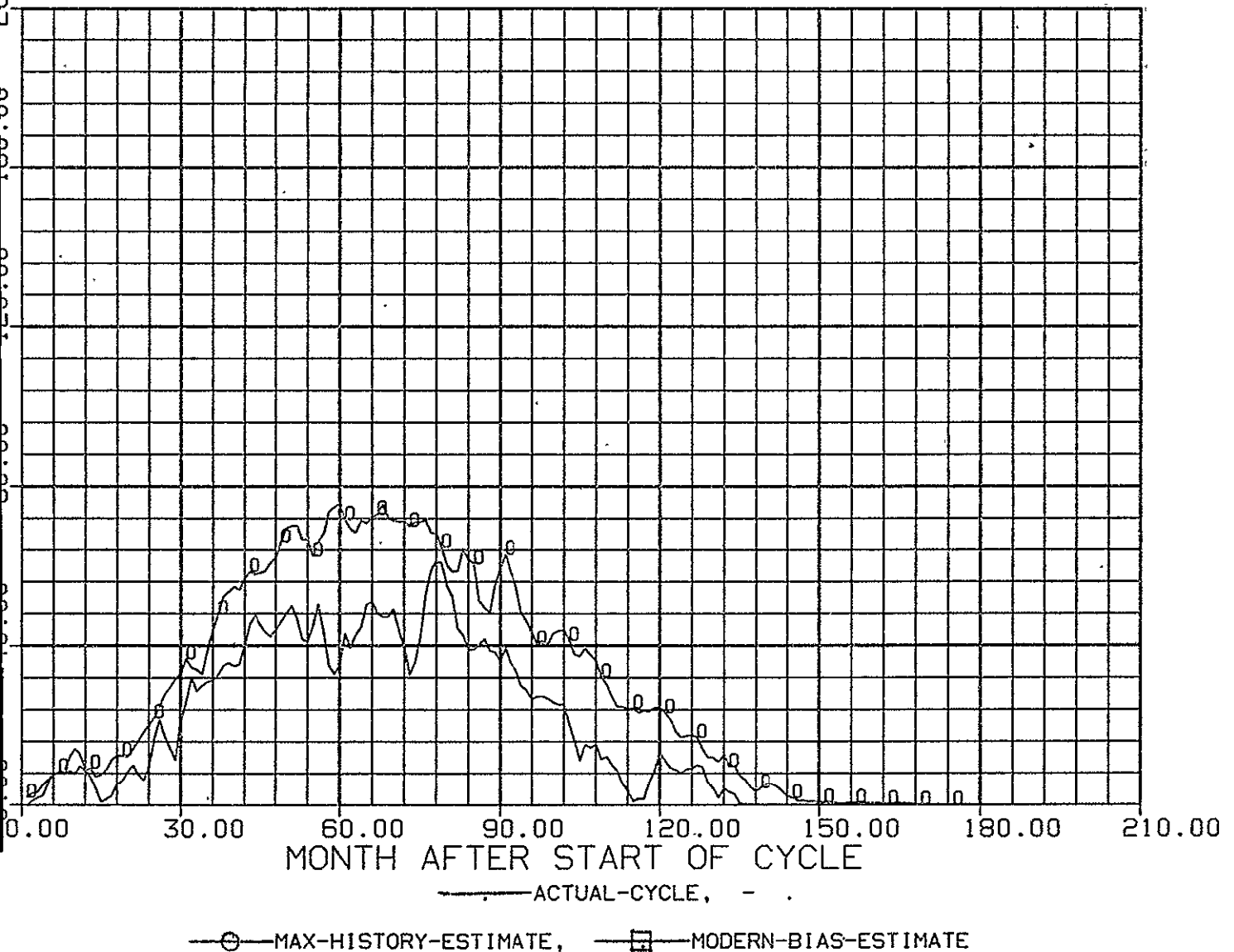


FIGURE - B4

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 6 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - JULY 1810

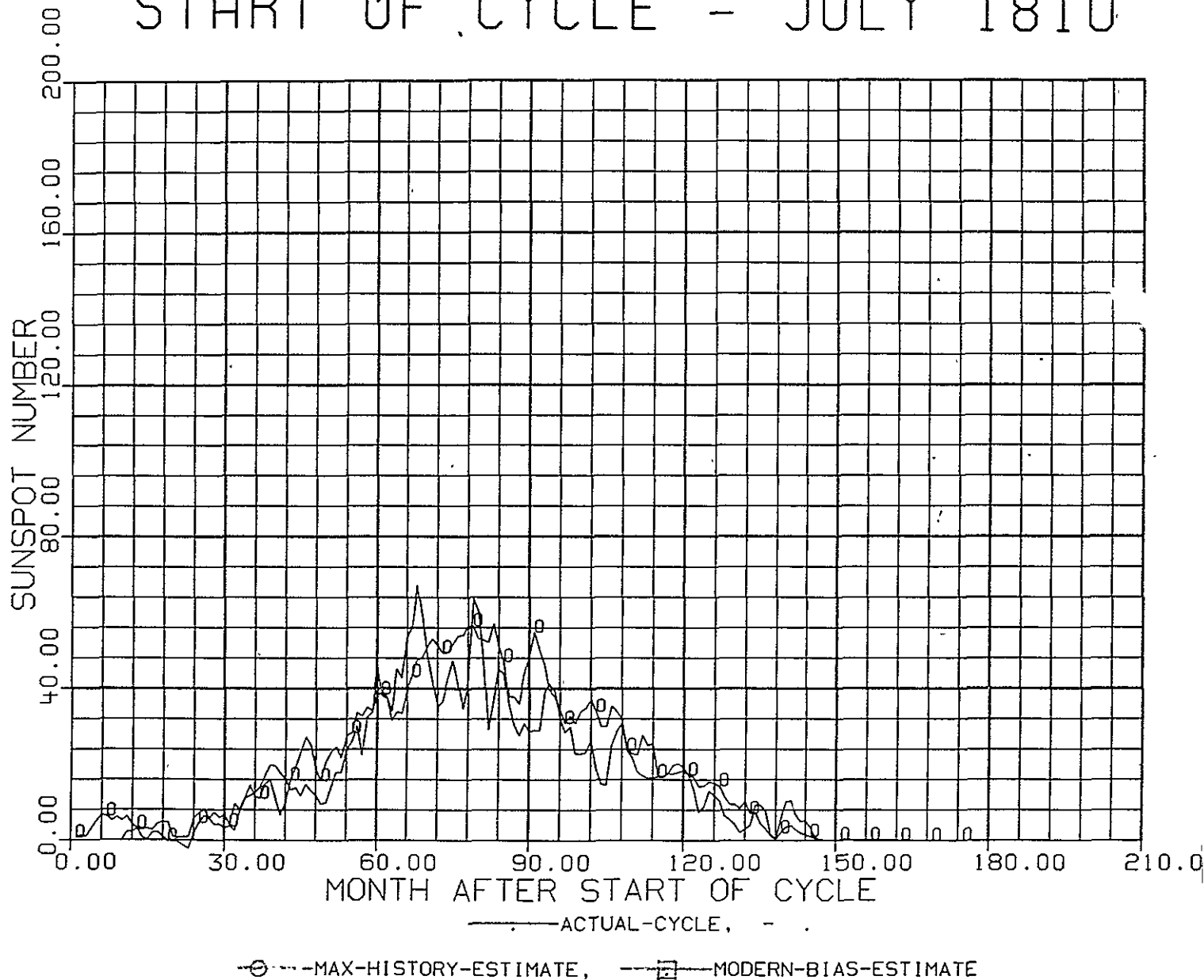


FIGURE - B5

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 7 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - APRIL 1823

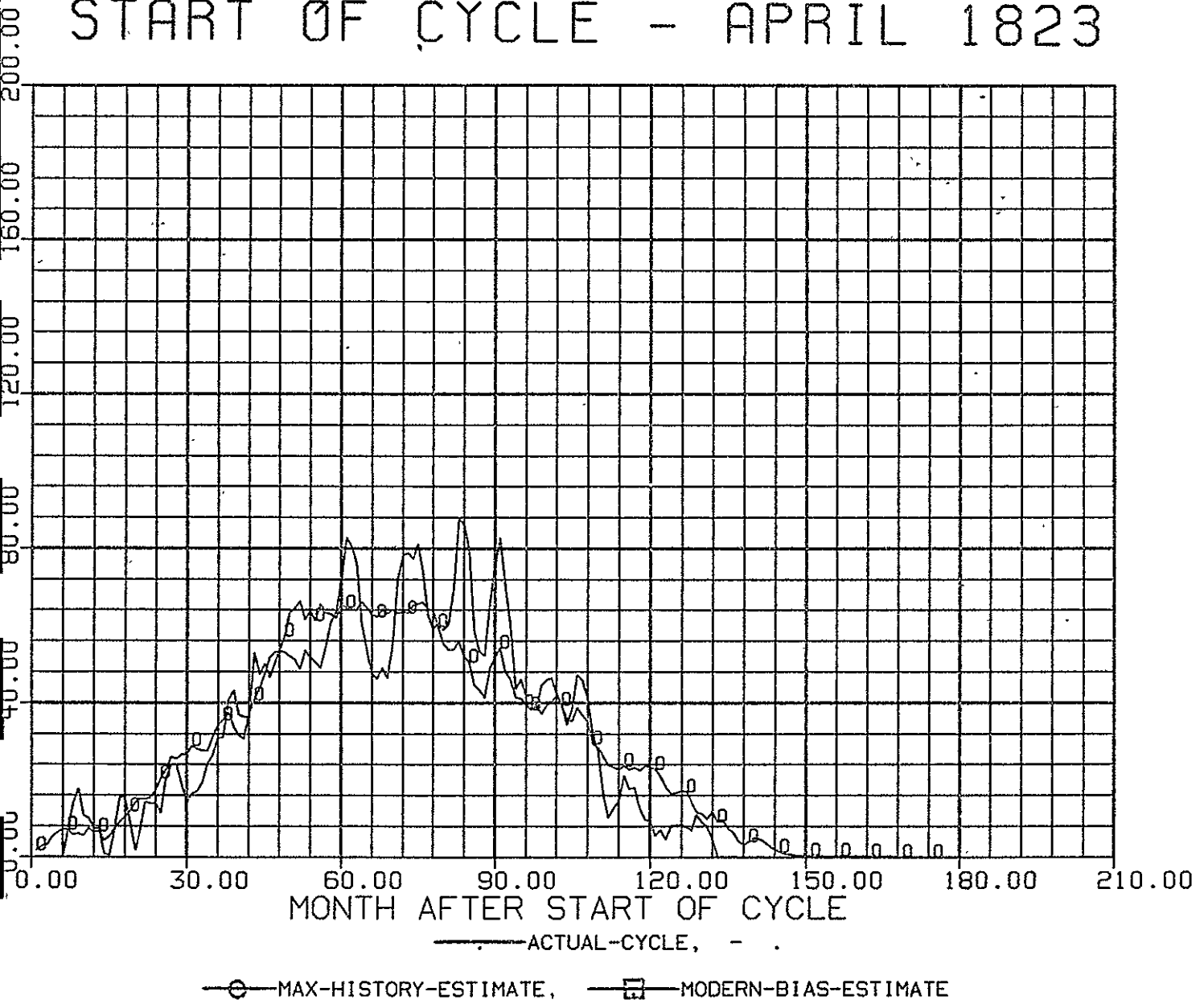


FIGURE - B6

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 8 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - NOVEMBER 1833

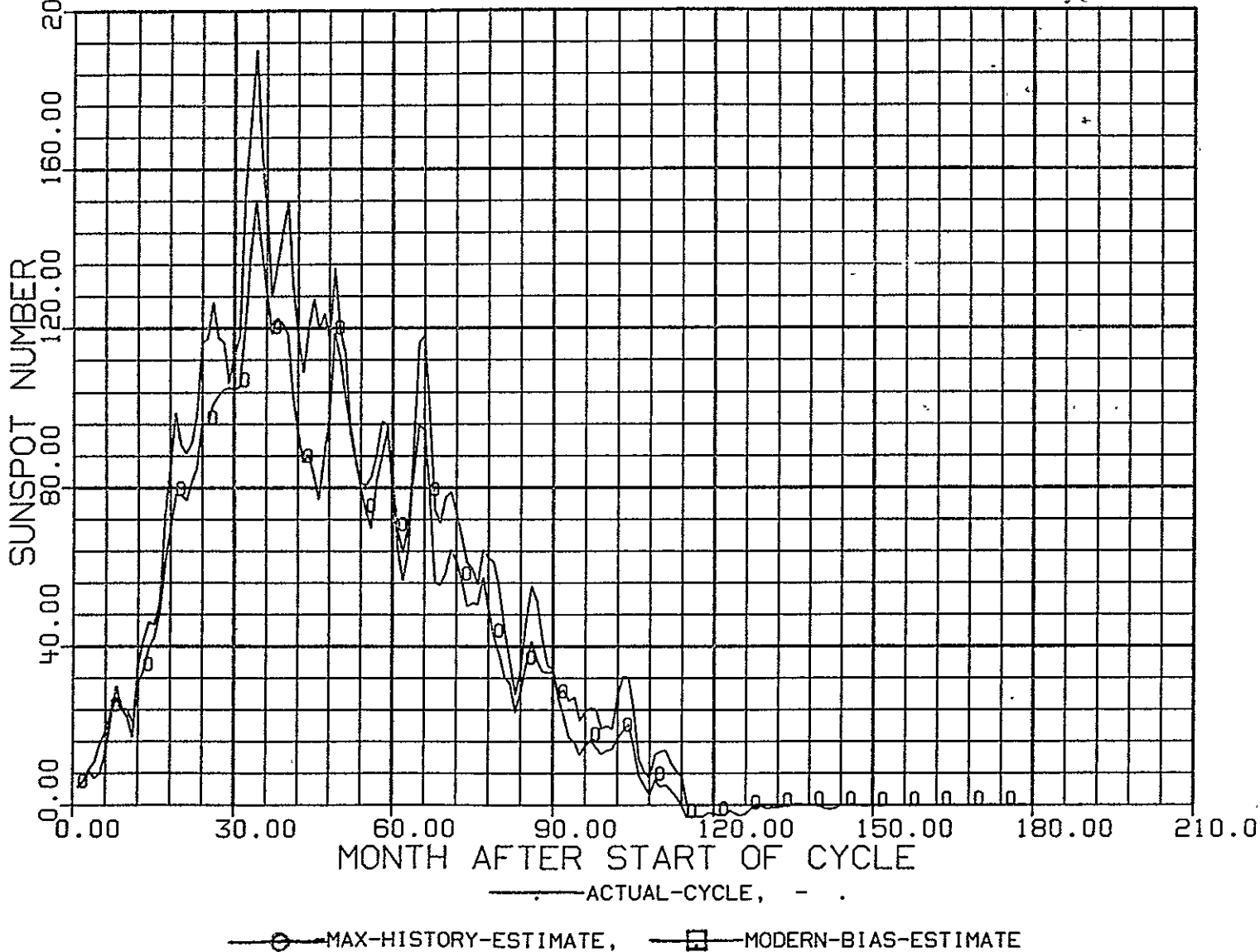


FIGURE - B7

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 9 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - JULY 1843

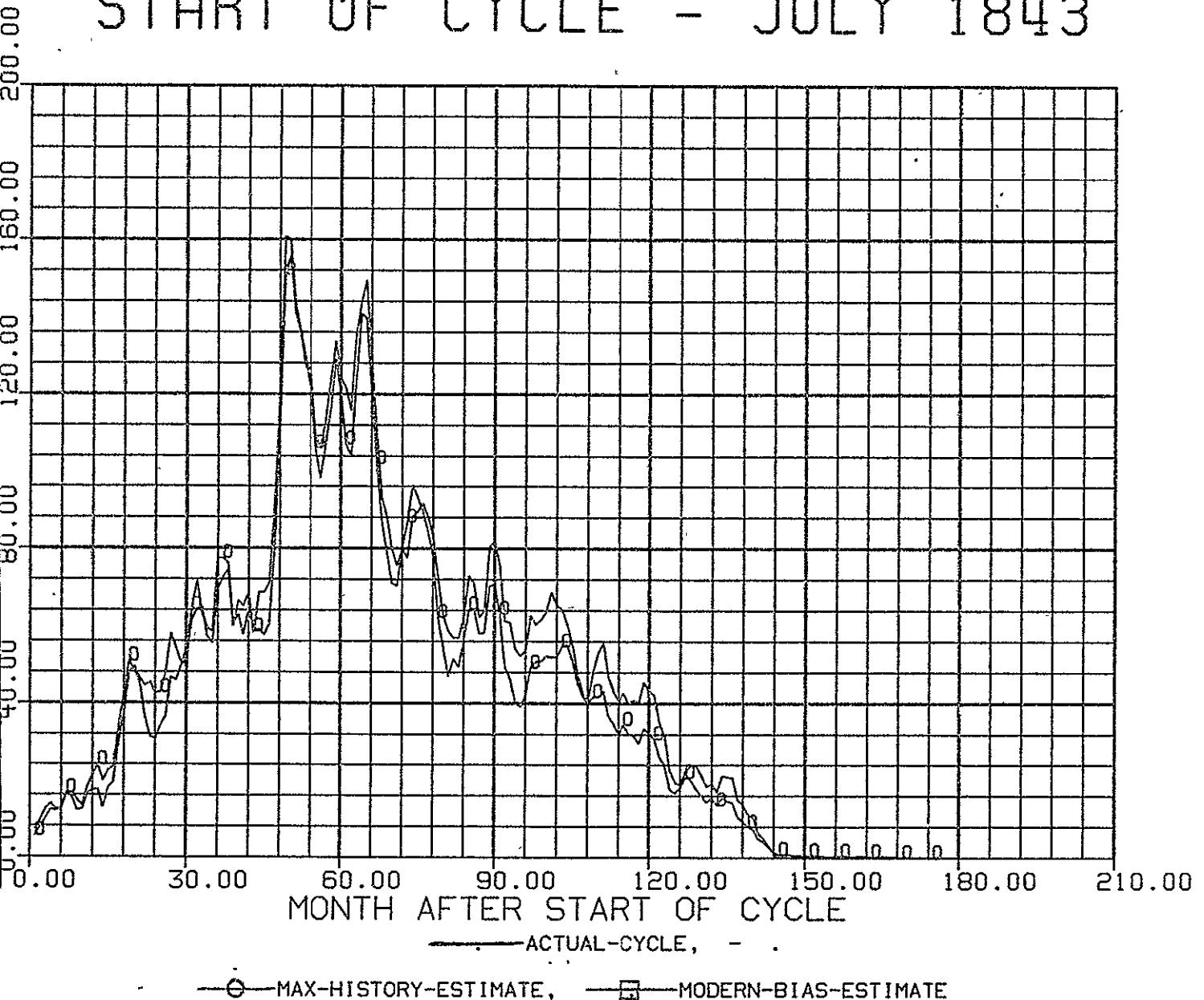


FIGURE - B8

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 10 WITH ACTUAL SUNSPOT NUMBR

START OF CYCLE - DECEMBER 1855

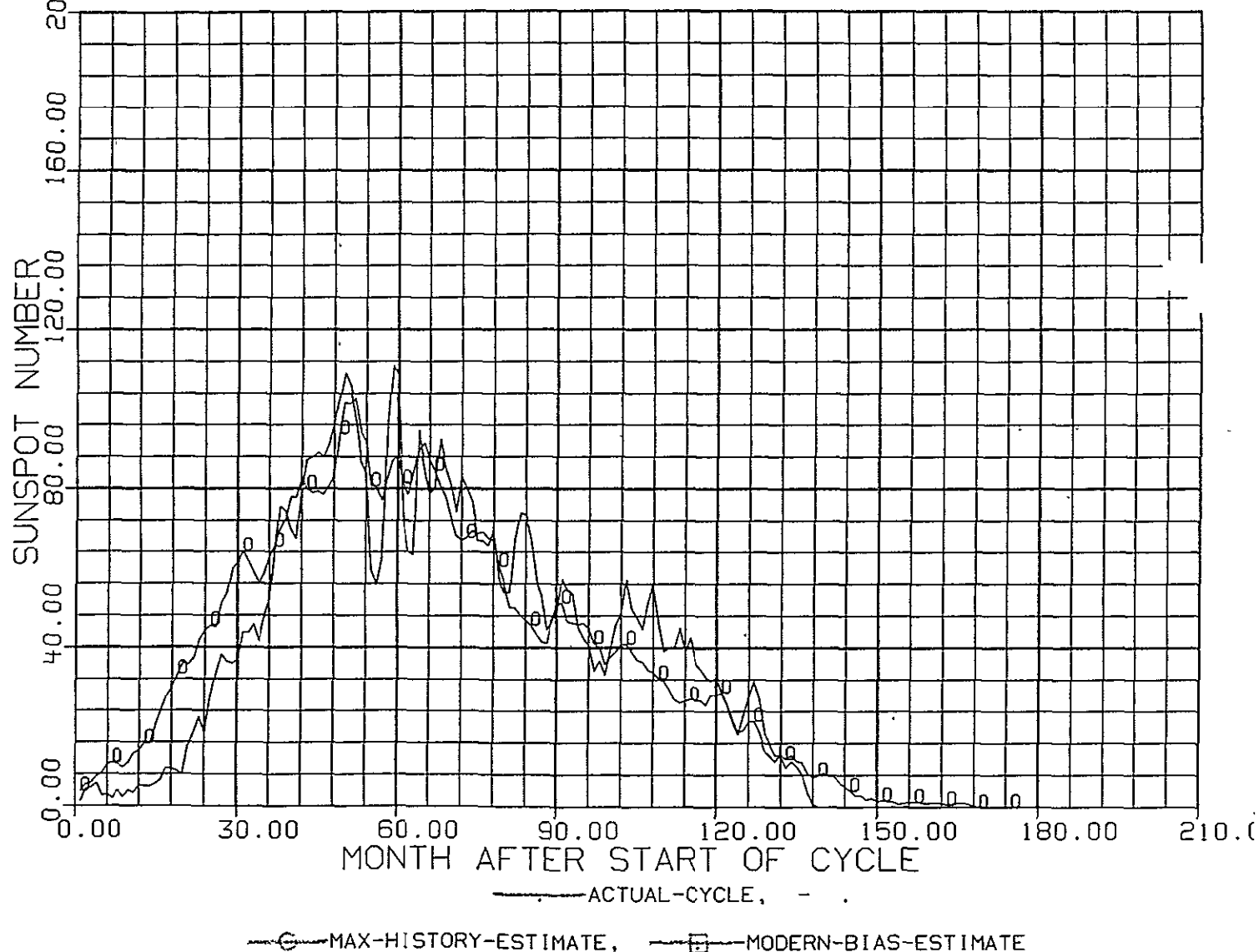


FIGURE - B9

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 11 WITH ACTUAL SUNSPOT NUMBR

START OF CYCLE - MARCH 1867

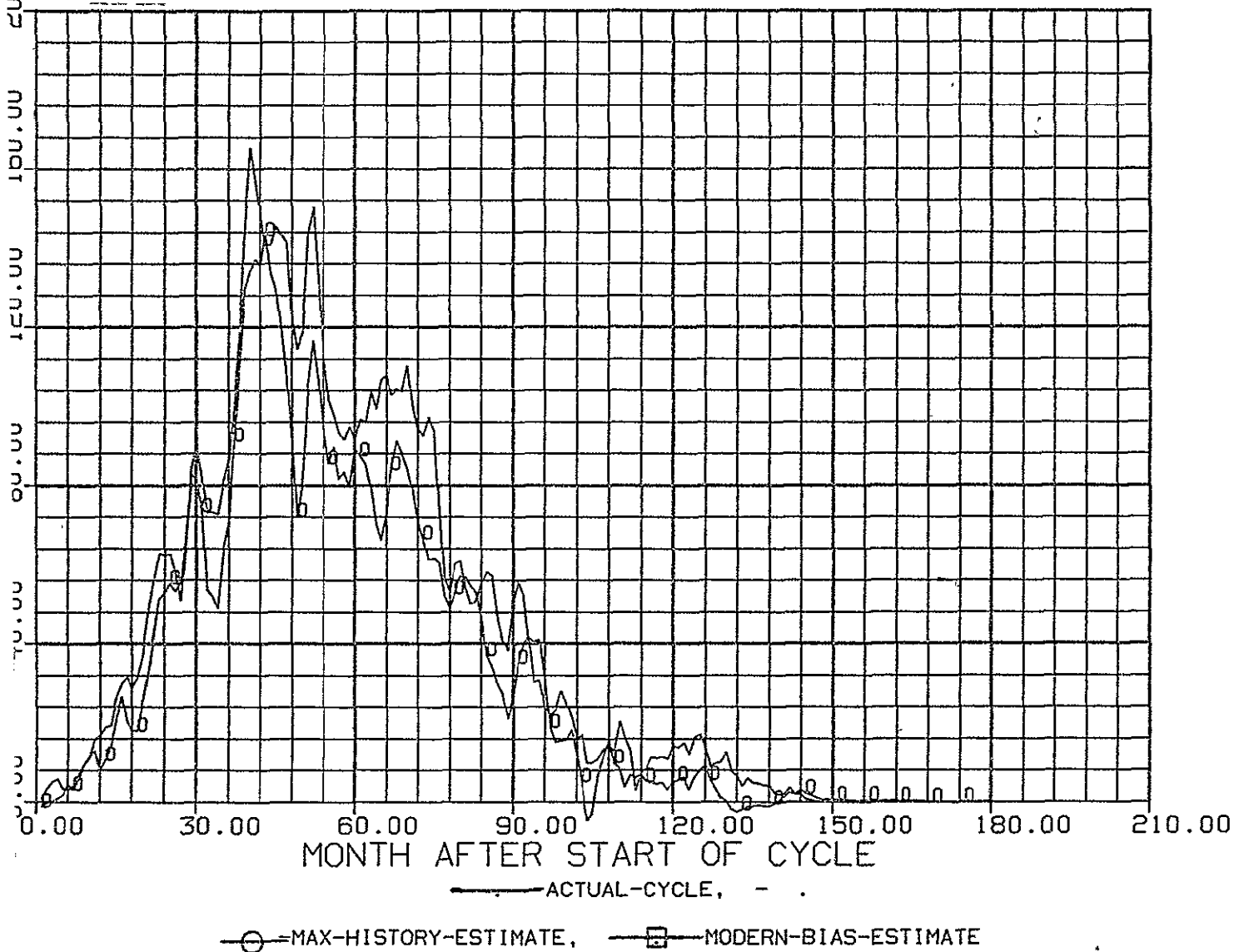
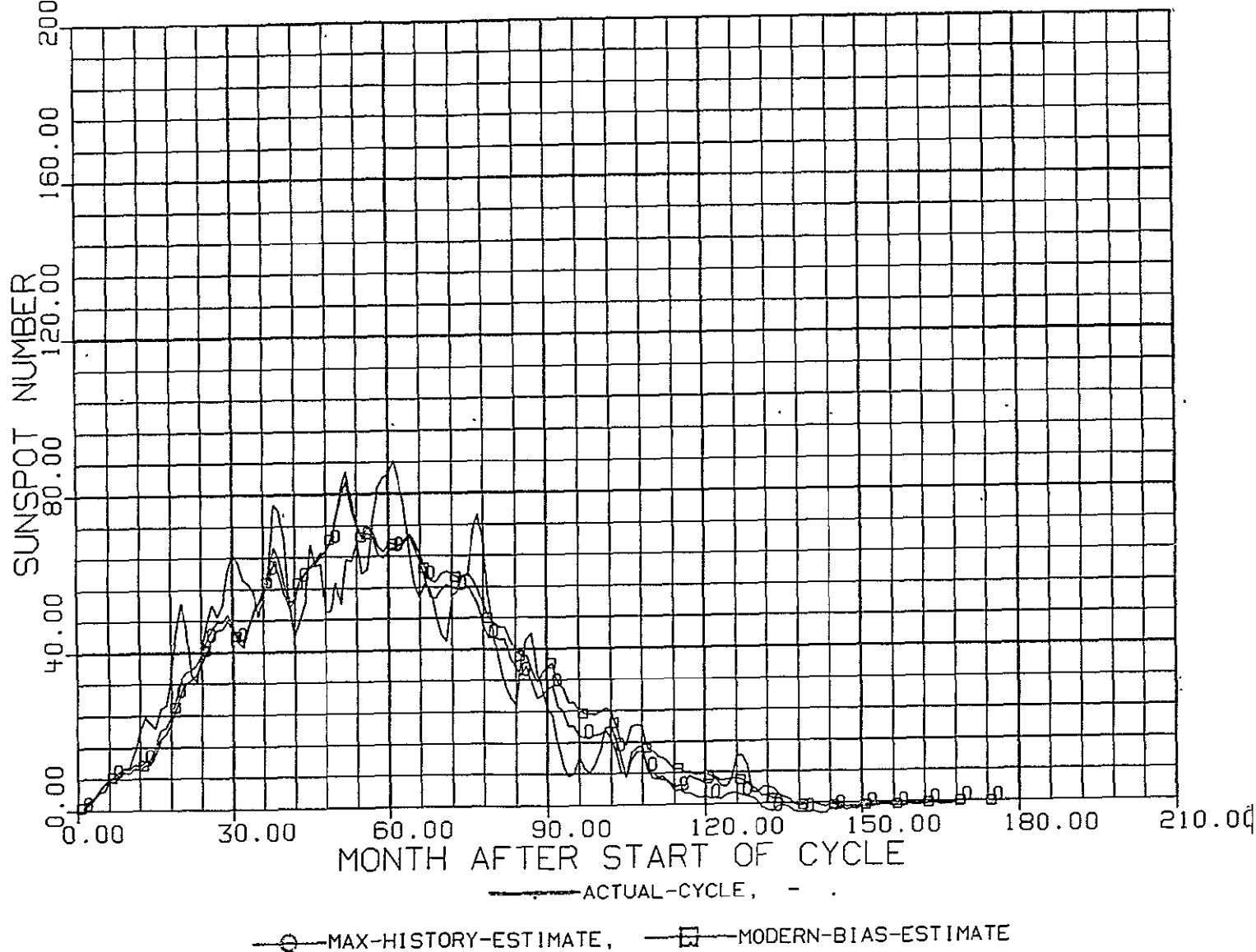


FIGURE - B10

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 12 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - NOVEMBER 1878



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FIGURE - B11

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 12 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - NOVEMBER 1878

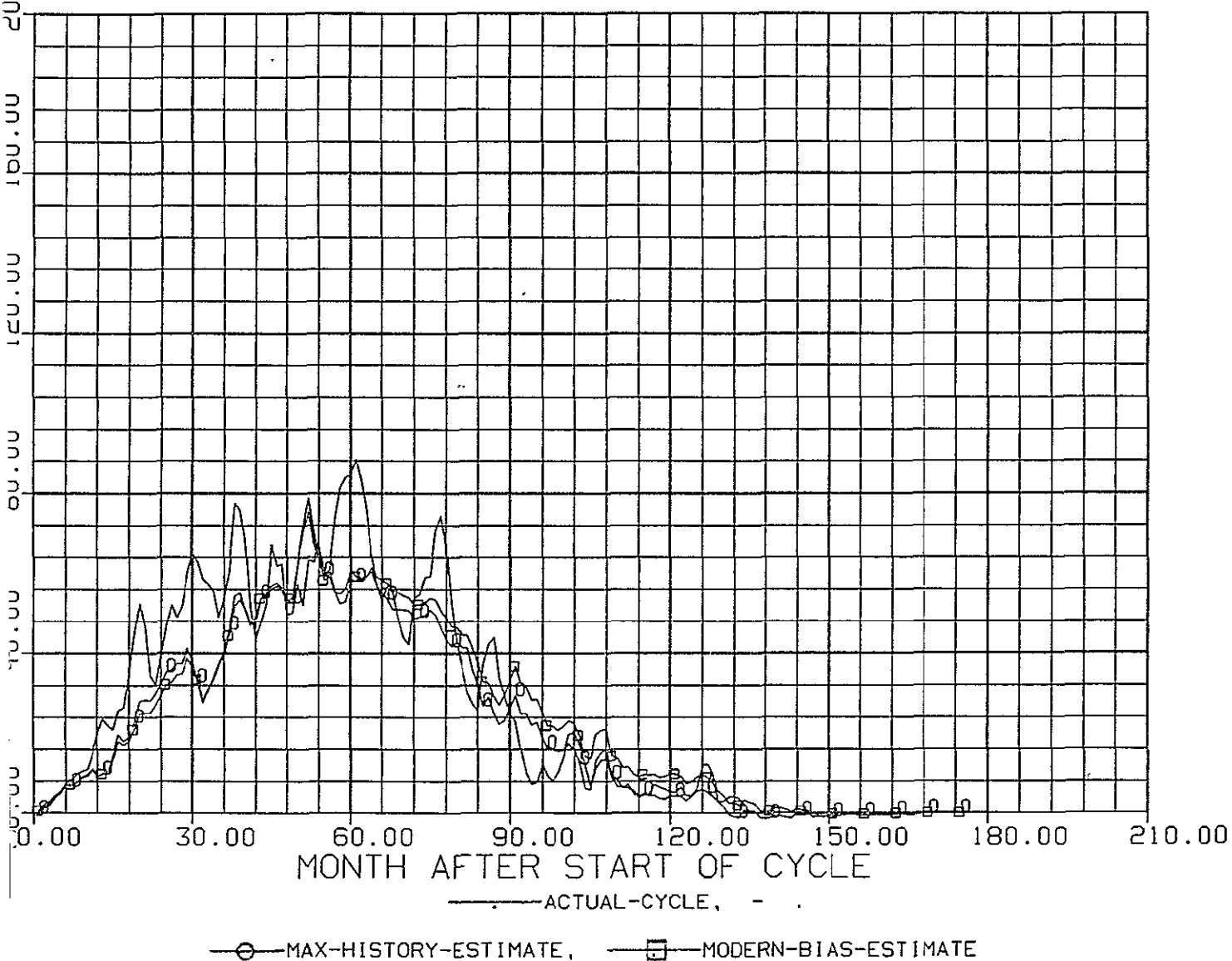


FIGURE - B12

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 13 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JUNE 1889

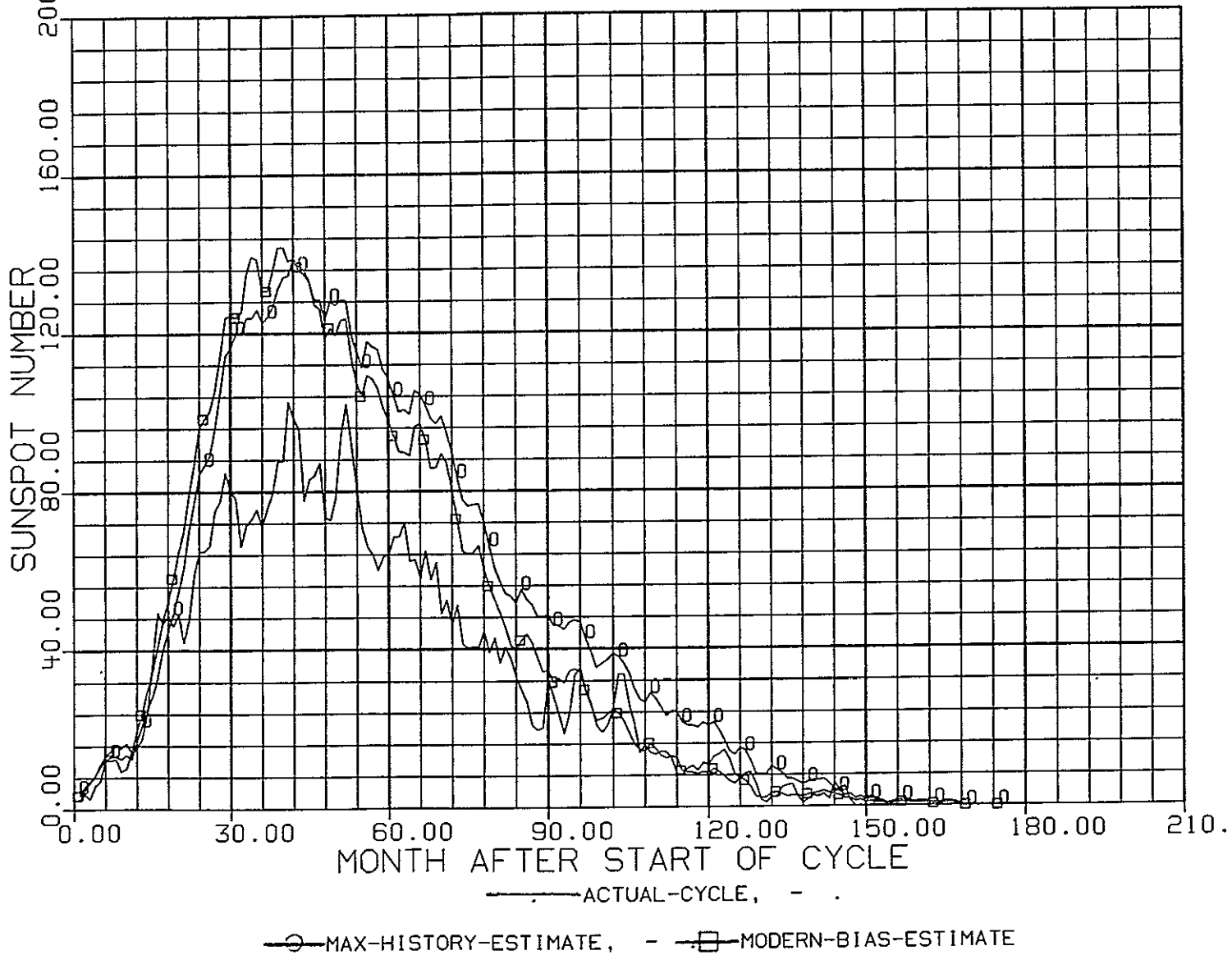


FIGURE - B13

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 13 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - JUNE 1889

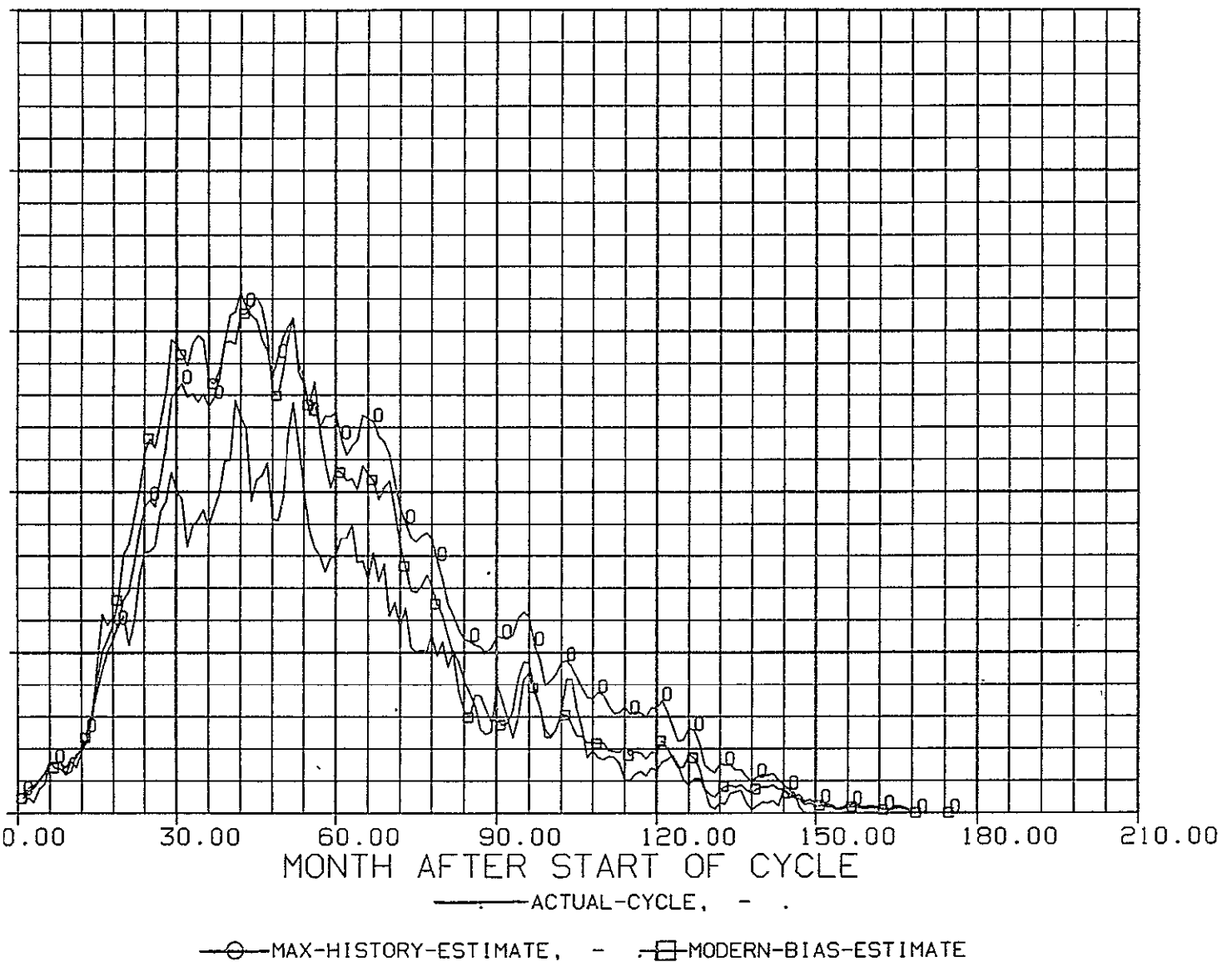
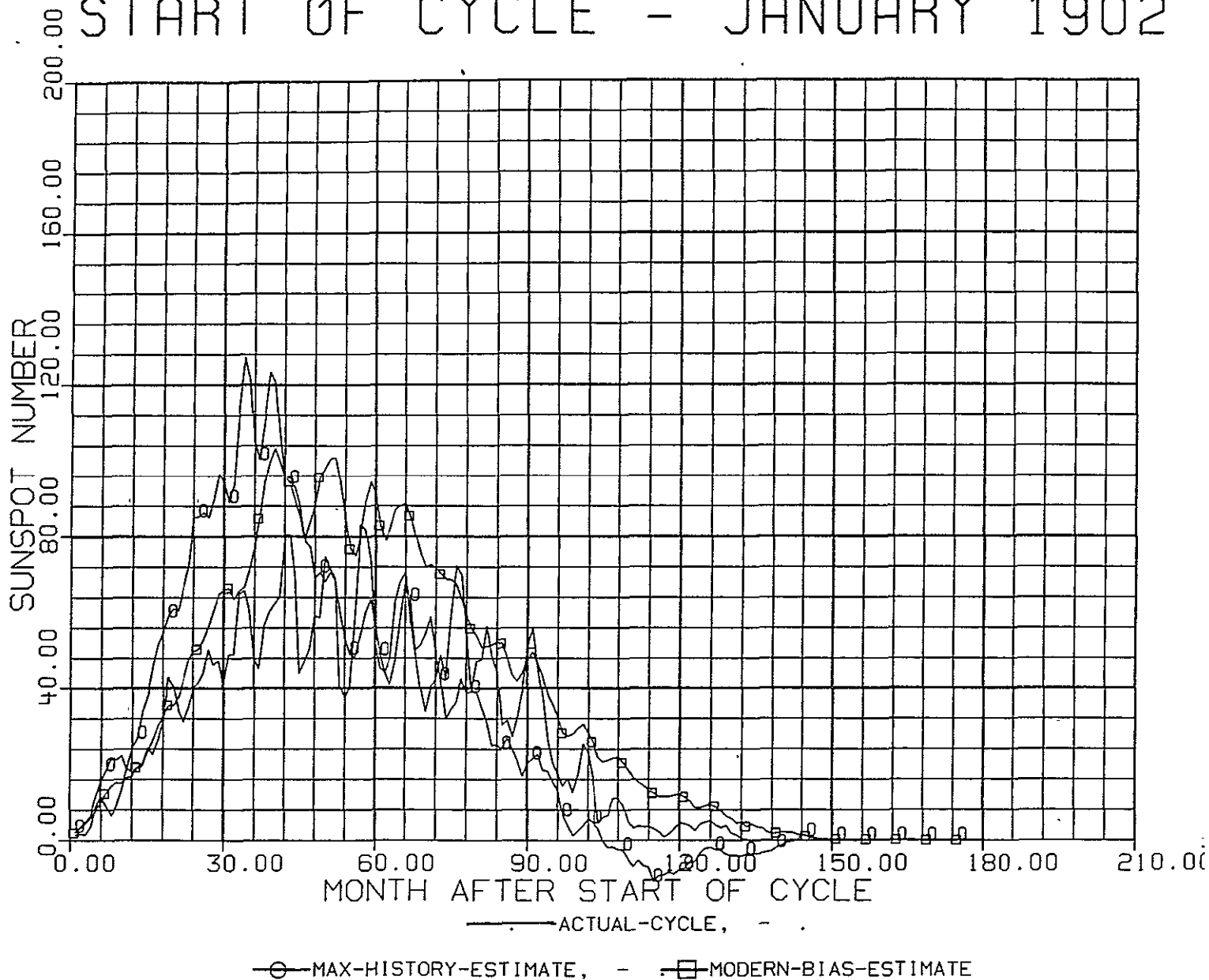


FIGURE - B14

COMPARISON OF SUNSPOT ONLY ESTIMATE OF ...
SUNSPOT CYCLE 14 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JANUARY 1902

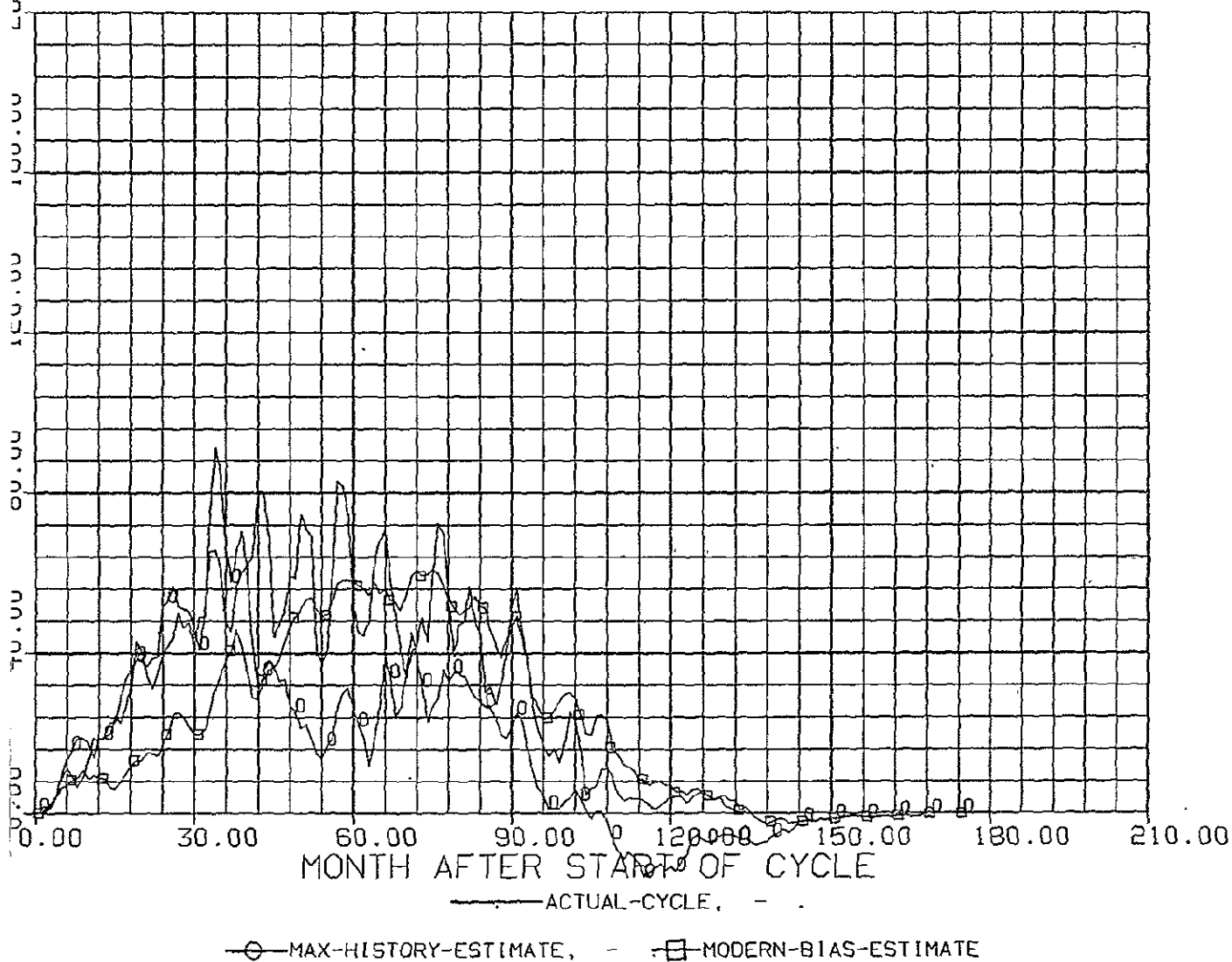


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FIGURE - B15

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 14 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JANUARY 1902

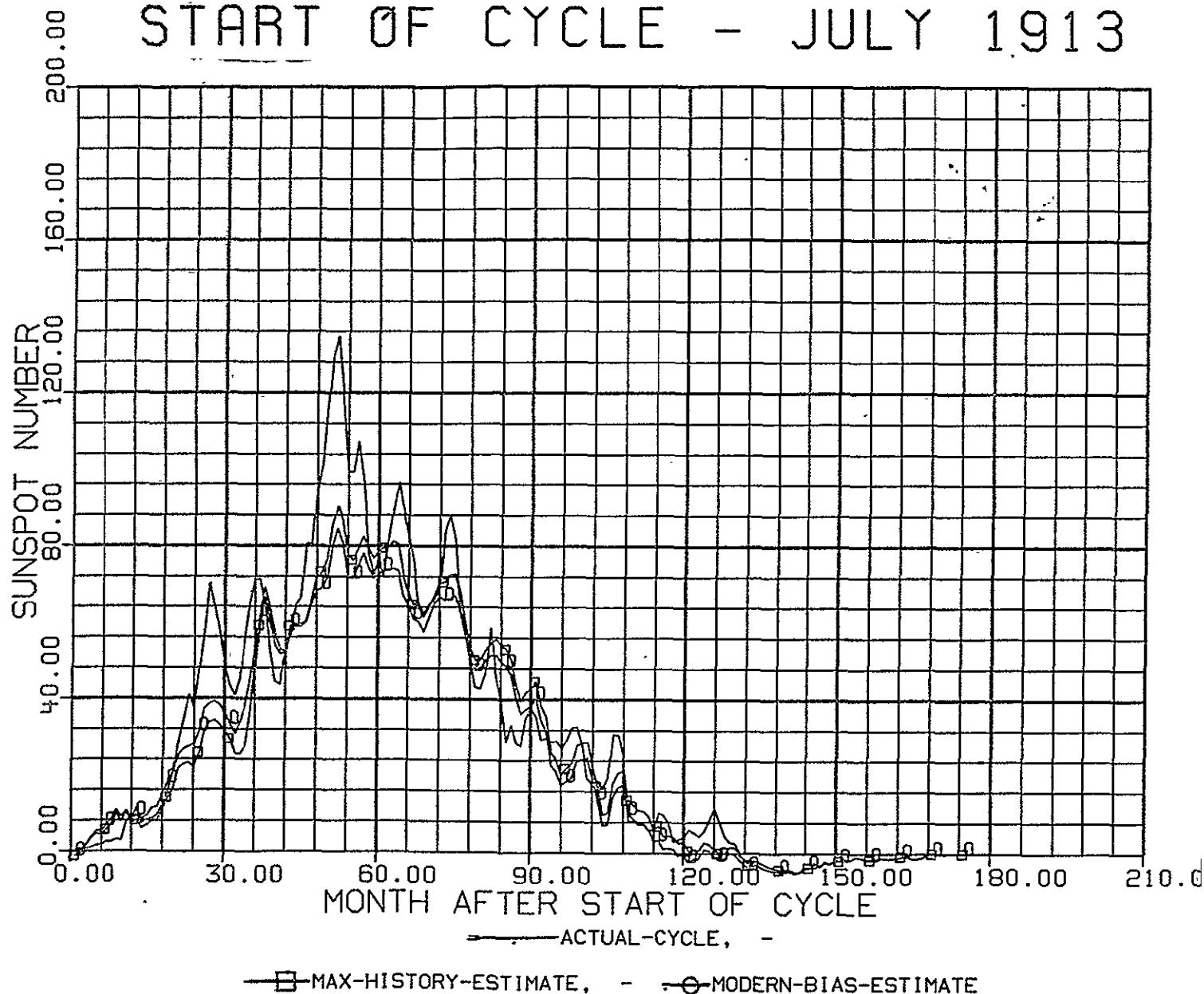


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FIGURE - B16

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 15 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JULY 1913



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FIGURE - B17

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 15 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - JULY 1913

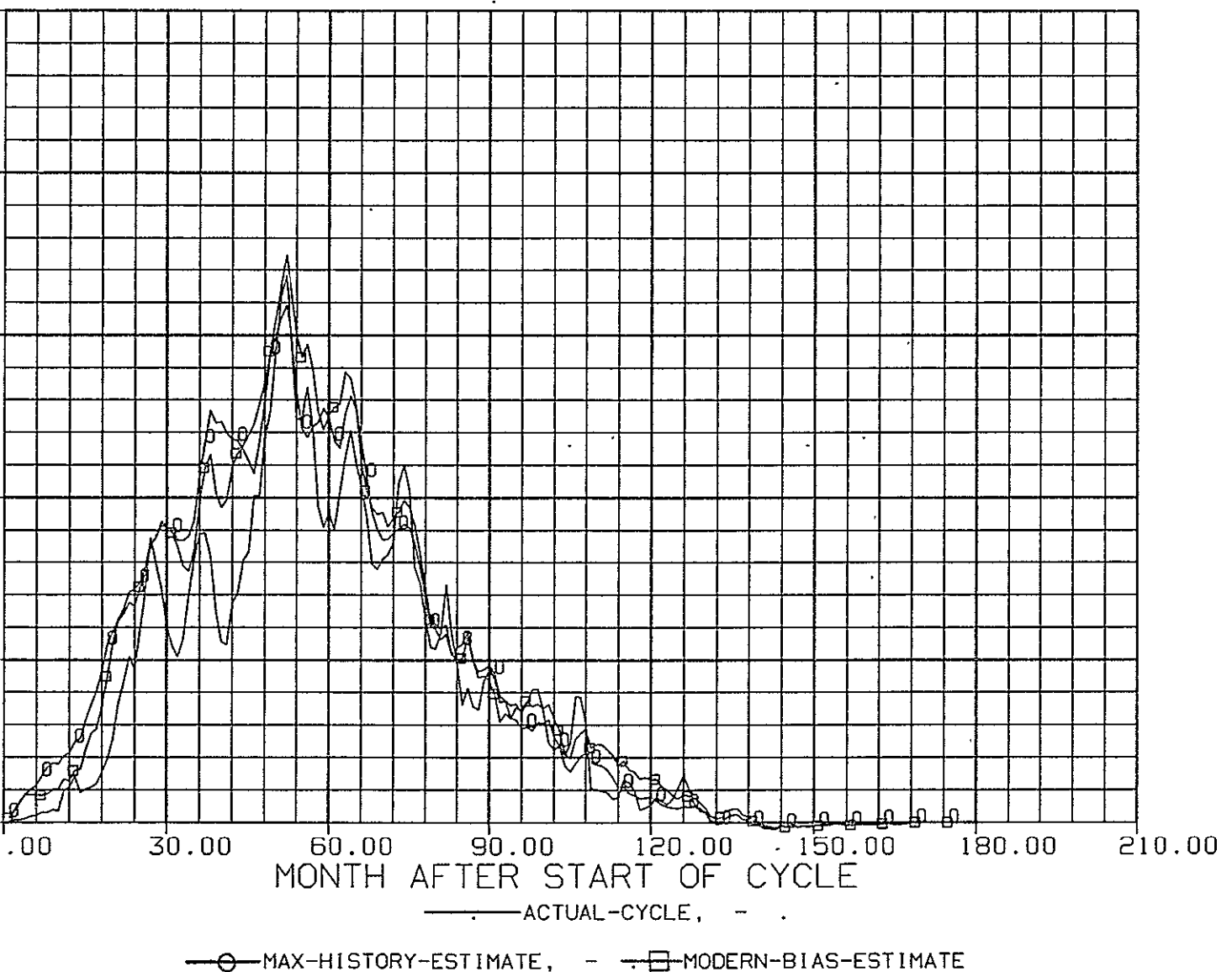


FIGURE - B18

COMPARISON OF SUNSPOT-ONLY ESTIMATE OF
SUNSPOT CYCLE 16 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - JULY 1923

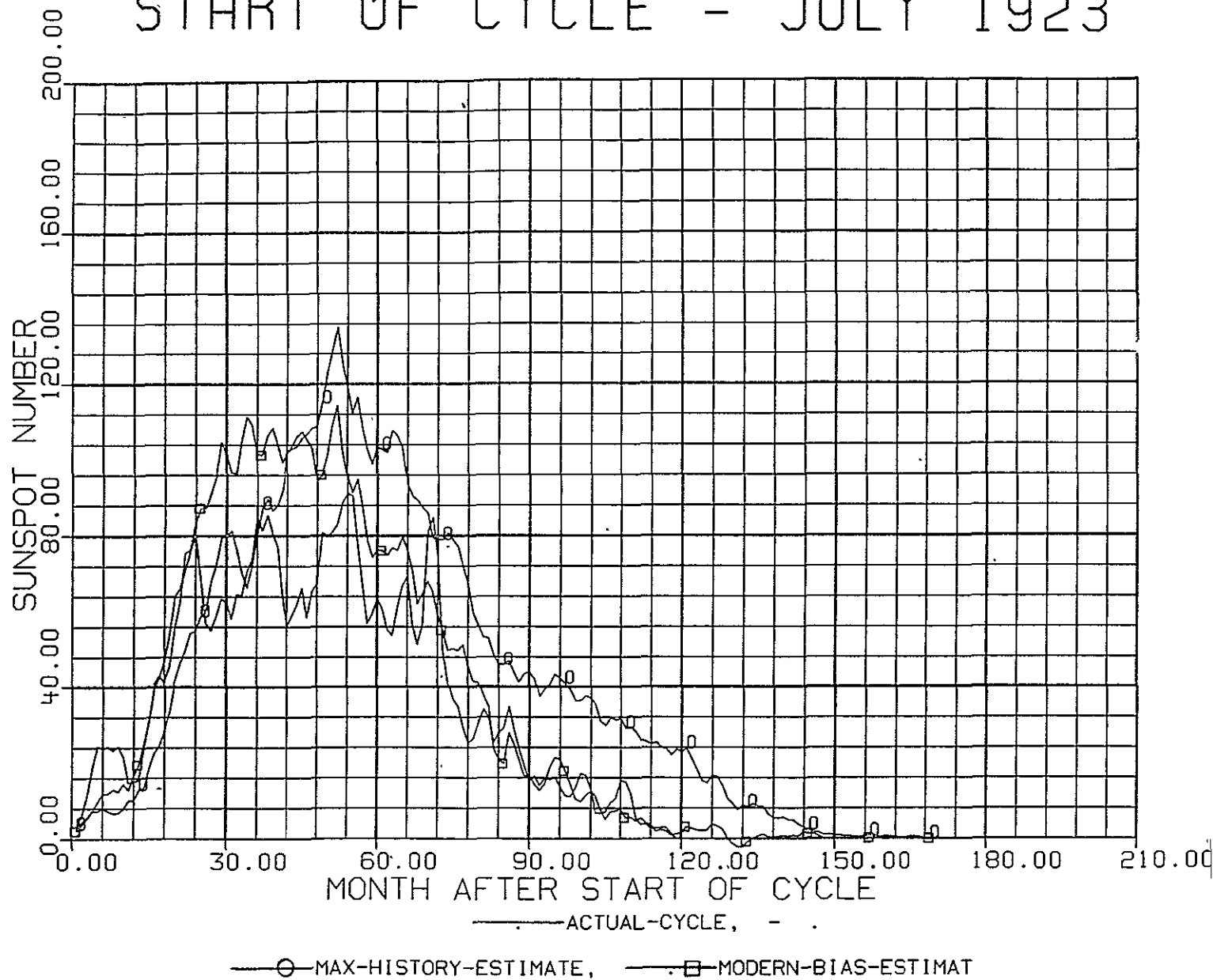


FIGURE - B19

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COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 16 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - JULY 1923

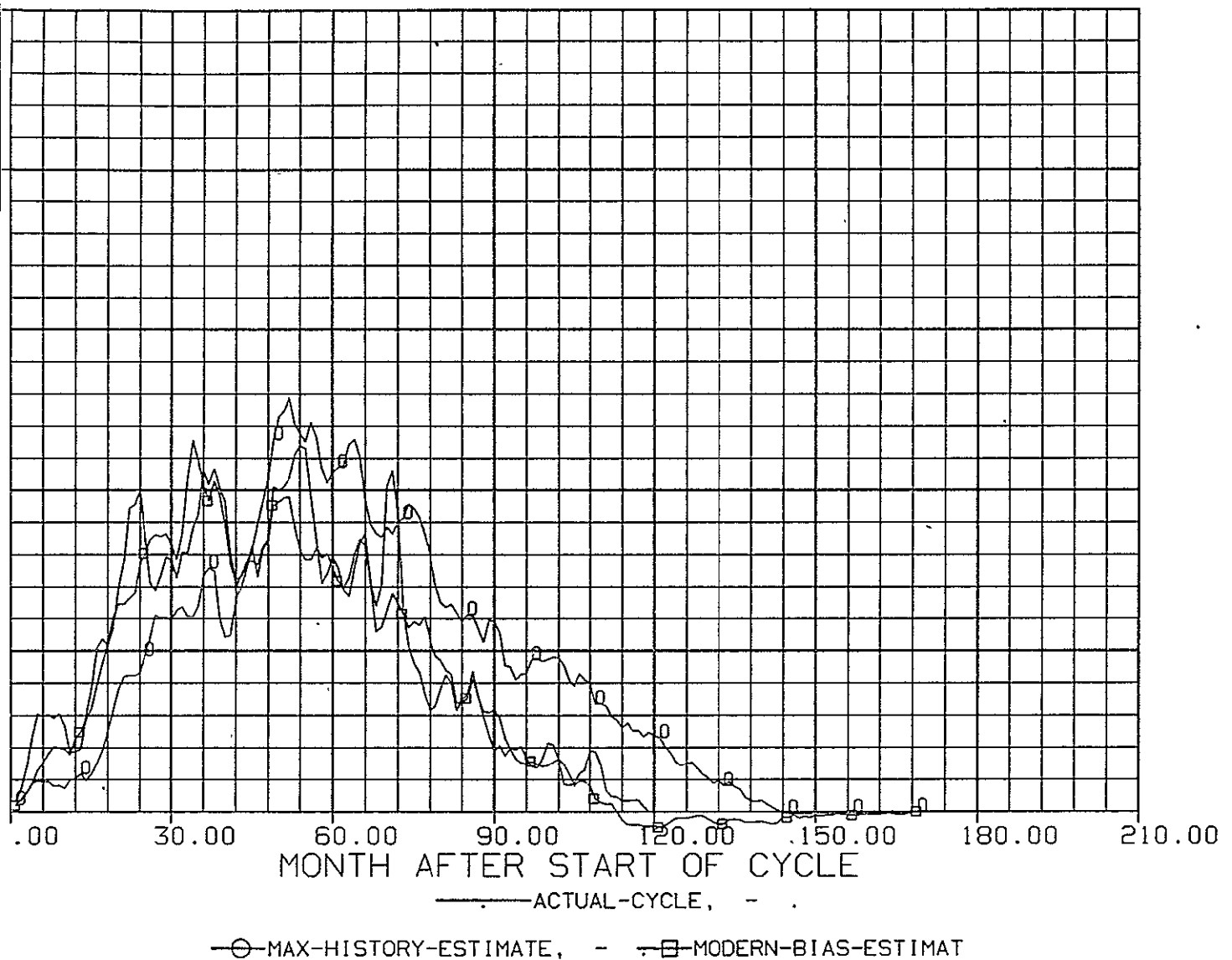
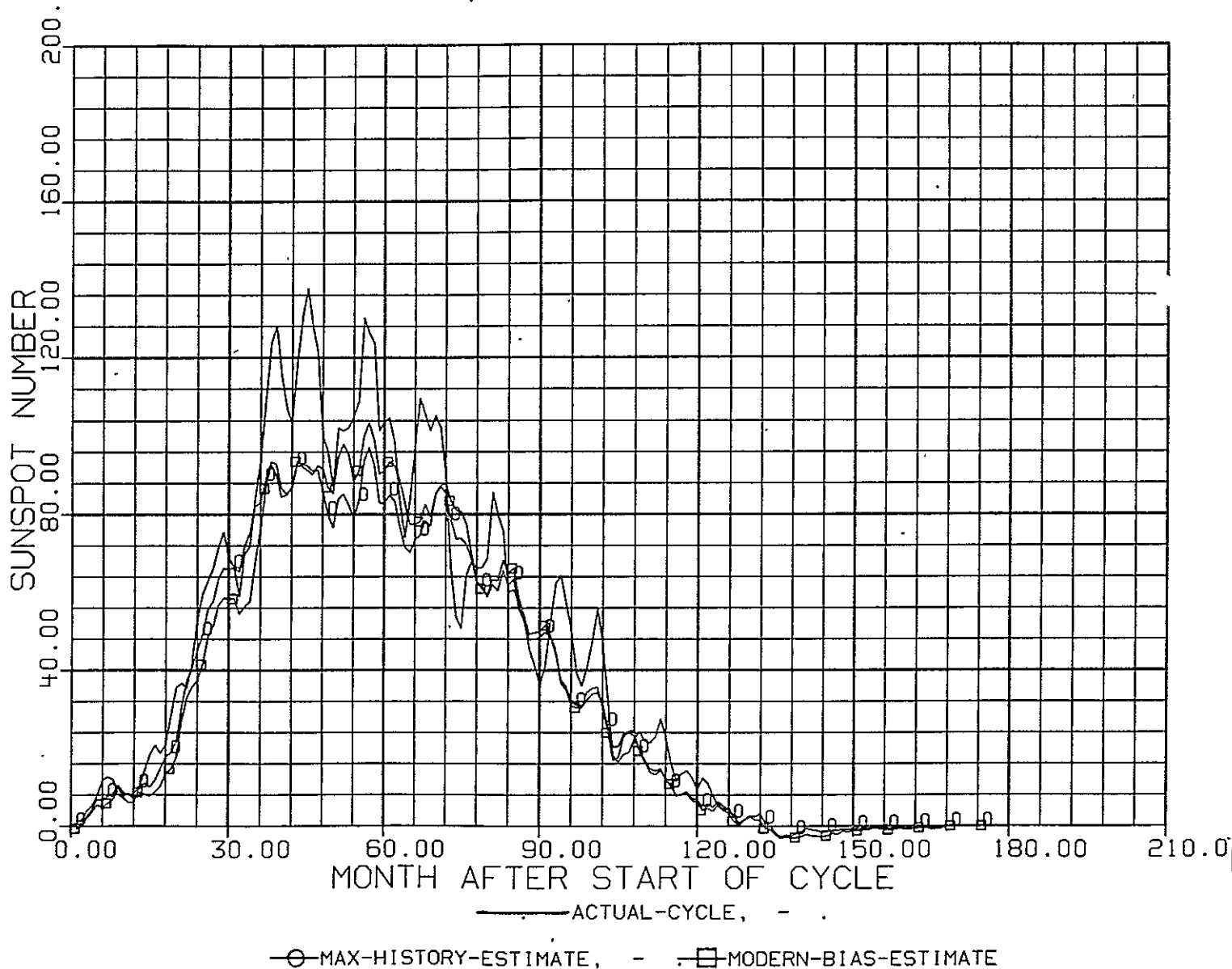


FIGURE - B20

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 17 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - SEPTEMBER 1933



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FIGURE - B21

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 17 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - SEPTEMBER 1933

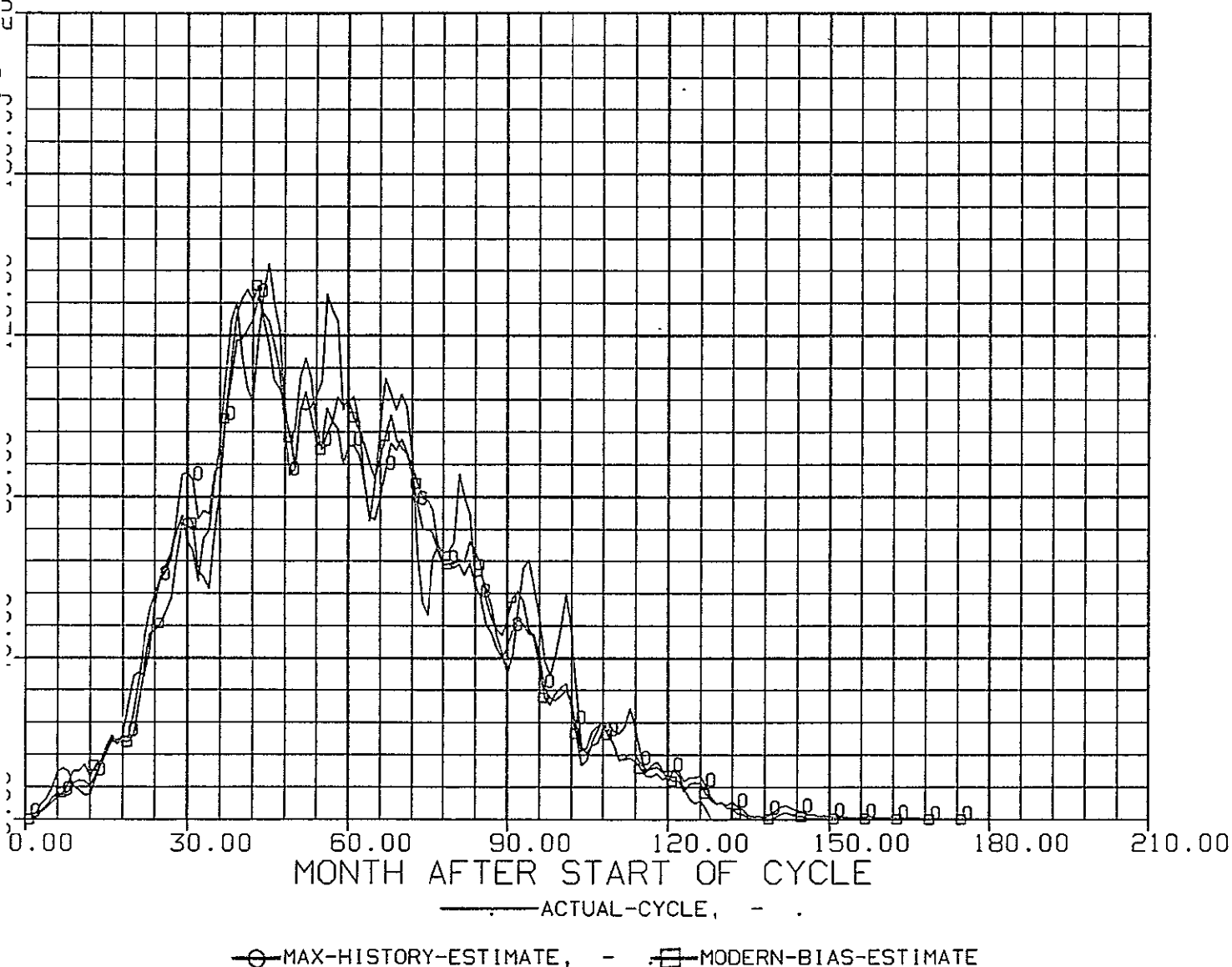
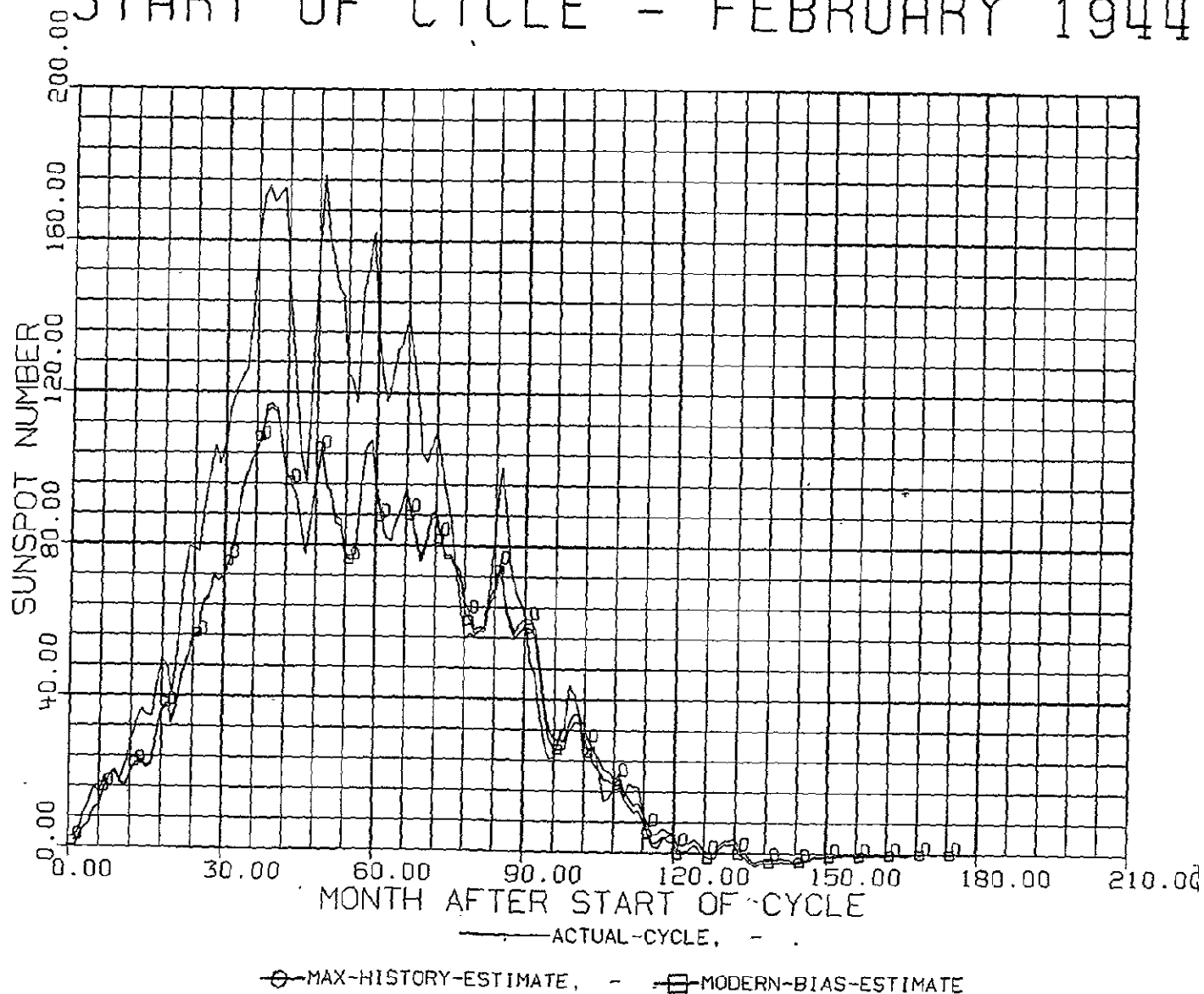


FIGURE - B22

COMPARISON OF SUNSPOT ONLY ESTIMATE OF
SUNSPOT CYCLE 18 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - FEBRUARY 1944



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FIGURE - B23

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 18 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - FEBRUARY 1944

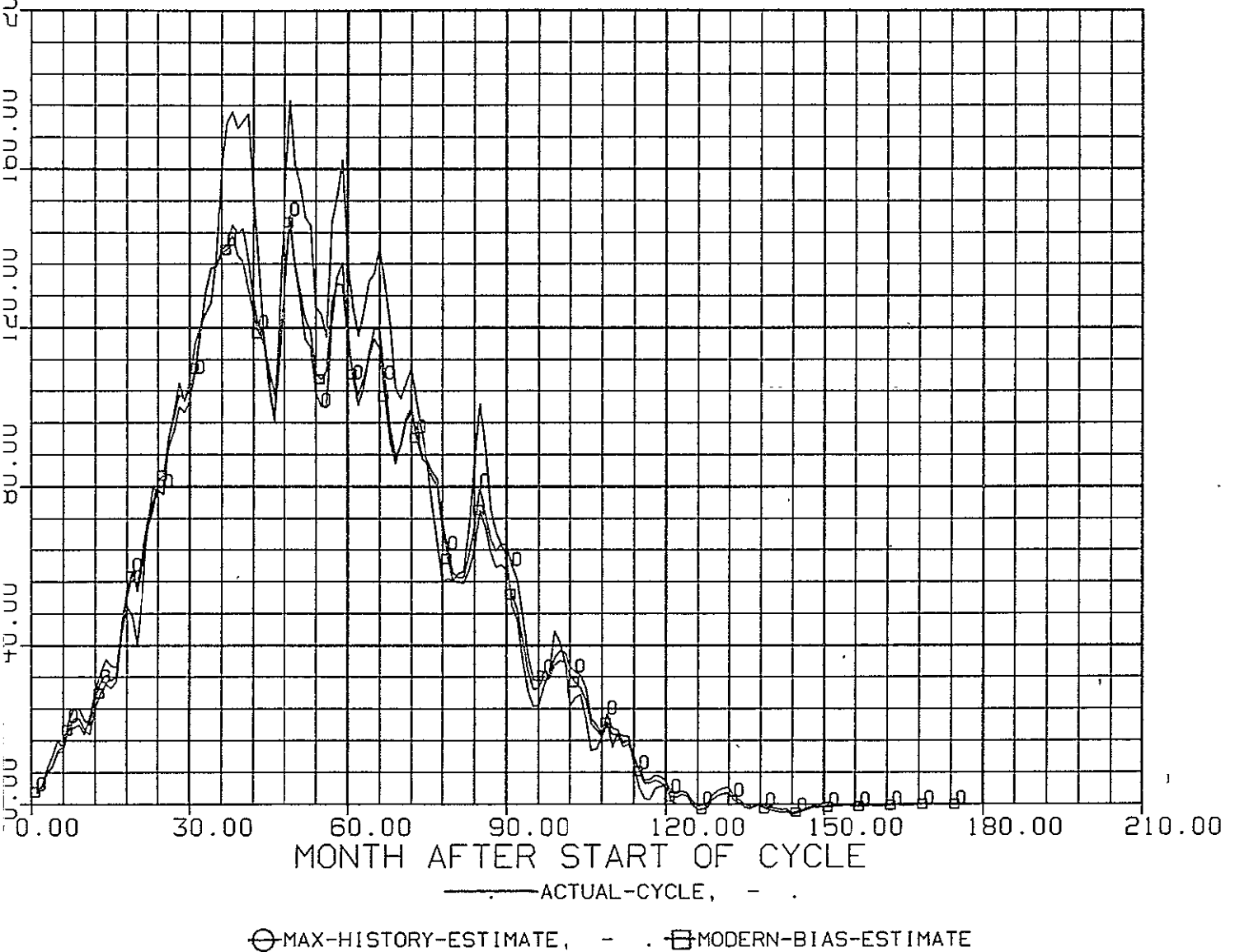
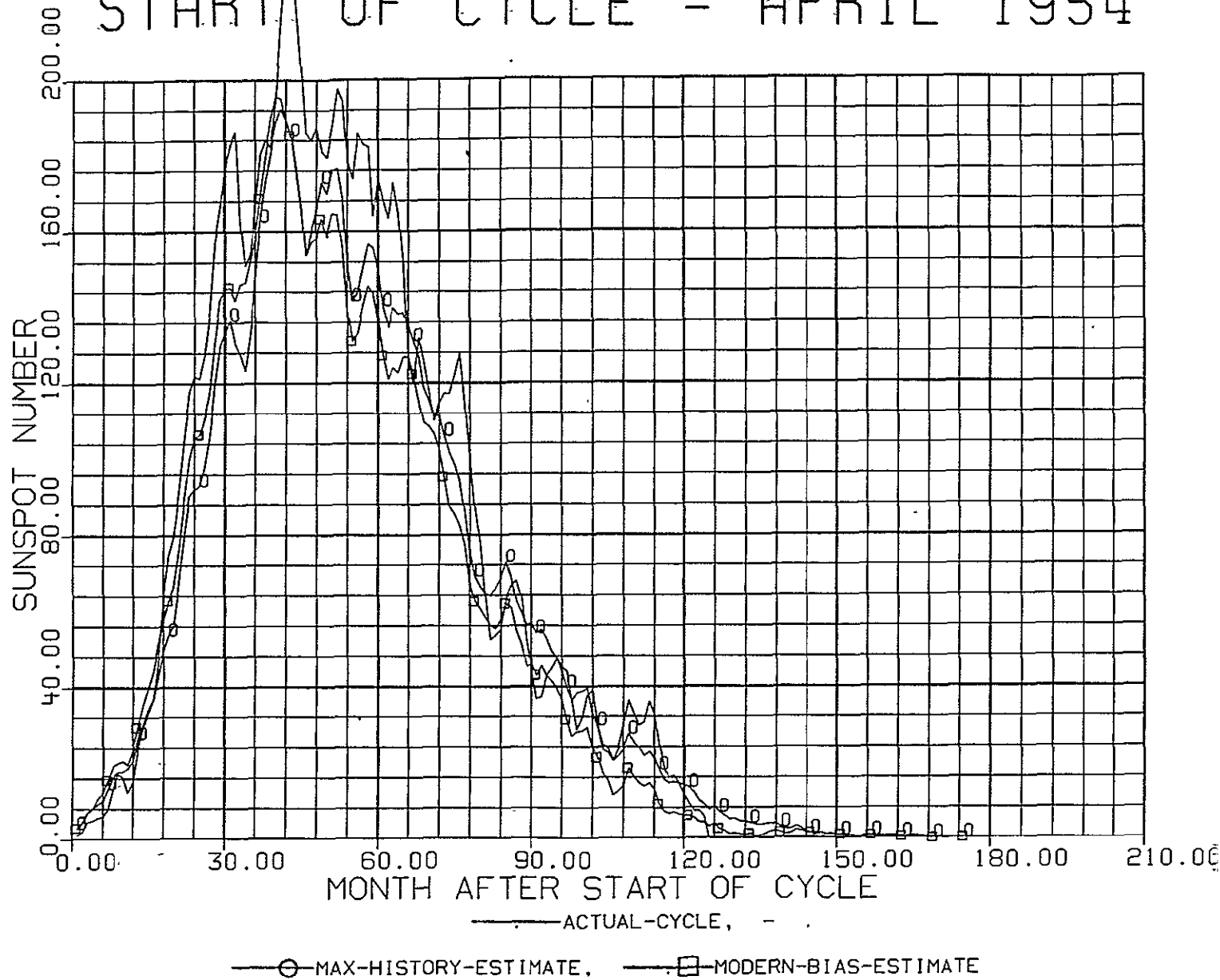


FIGURE - B24

COMPARISON OF SUNSPOT-ONLY ESTIMATE OF
SUNSPOT CYCLE 19 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - APRIL 1954



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FIGURE - B25

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 19 WITH ACTUAL SUNSPOT NUMBER
START OF CYCLE - APRIL 1954

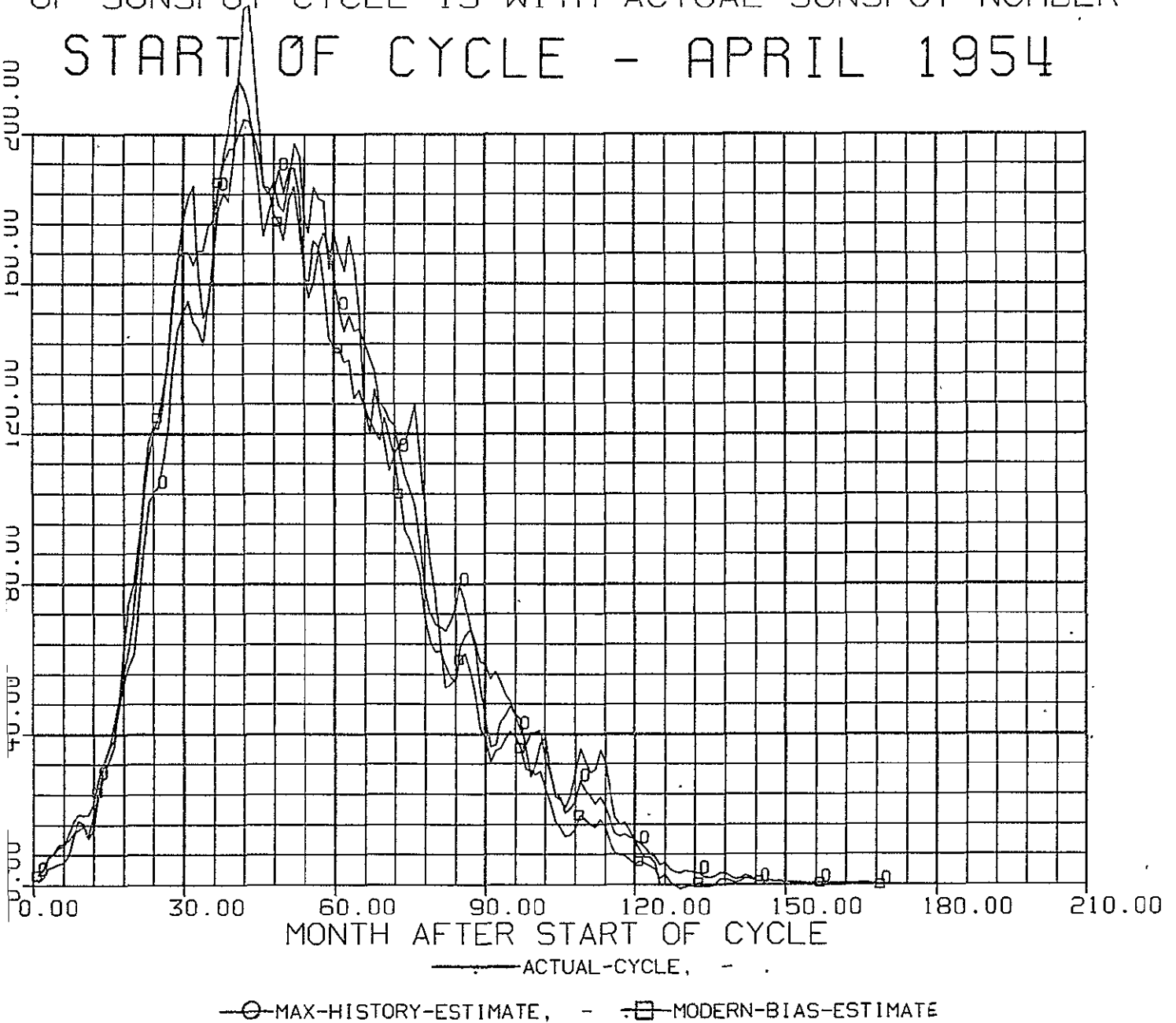
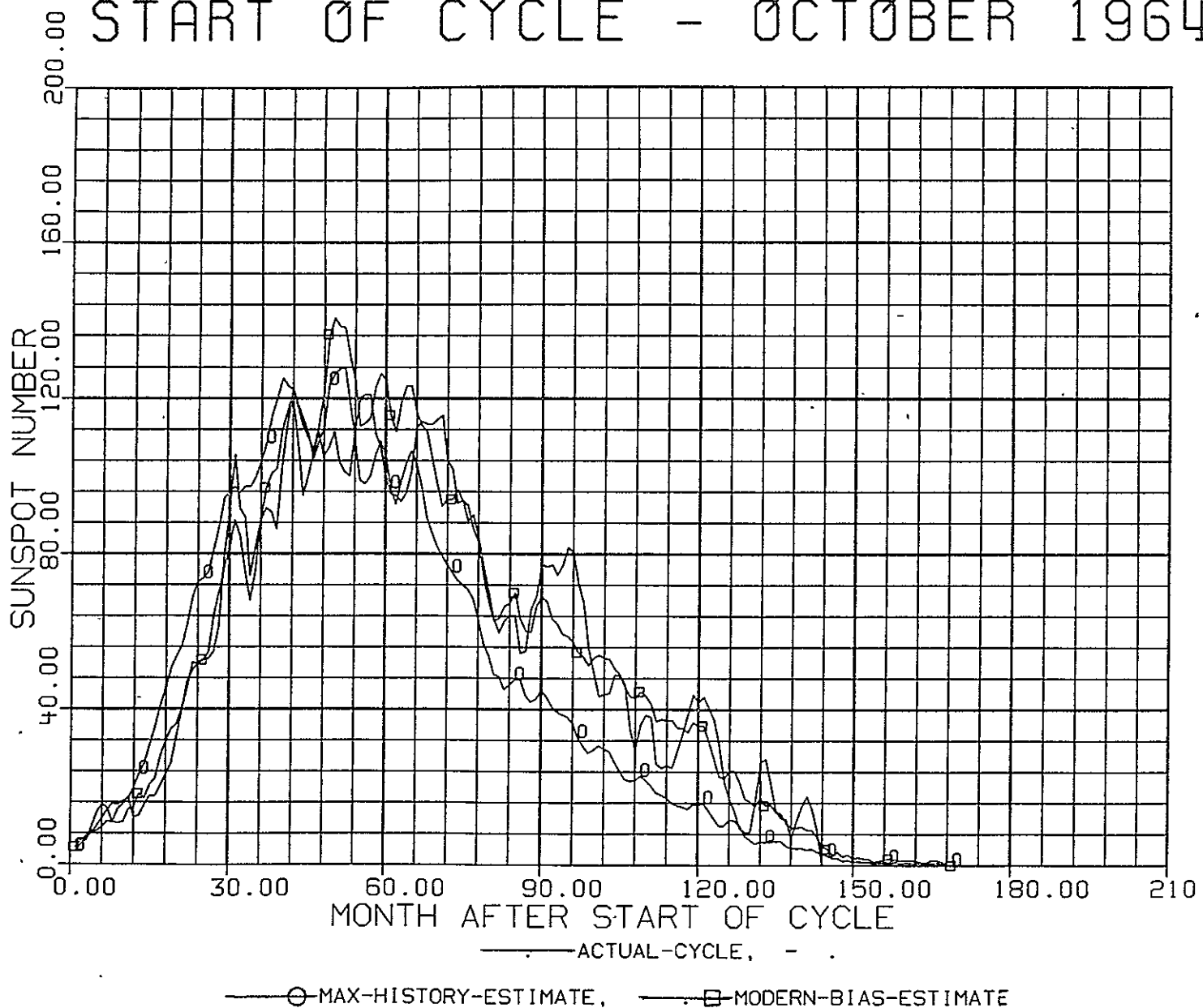


FIGURE - B26

COMPARISON OF SUNSPOT-ONLY ESTIMATE OF
SUNSPOT CYCLE 20 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - OCTOBER 1964



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FIGURE - B27

COMPARISON OF MAGNETIC + SUNSPOT ESTIMATE
OF SUNSPOT CYCLE 20 WITH ACTUAL SUNSPOT NUMBER

START OF CYCLE - OCTOBER 1964

